

TRANSLATING

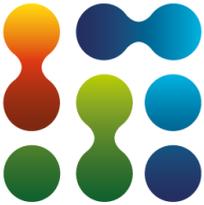
SCIENCE

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CARBON

Presented by

N National Centre
for Writing

 norwich
research
park

Changing lives | Rethinking society

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INTRODUCTION

by Professor Anne Osbourn



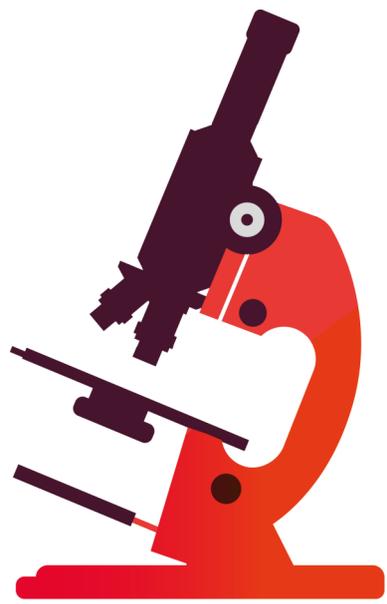
Translating Science is an experiment. There is so much exciting scientific research under way in Norwich. This research, carried out across the six partner organisations on the Norwich Research Park (the University of East Anglia, the Norfolk and Norwich Hospital, the John Innes Centre, the Earlham Institute, the Quadram Institute and the Sainsbury Laboratory), tackles major challenges such as ensuring that we have a plentiful and nutritious food supply, understanding human health and nutrition, combatting disease, and finding creative solutions to biodiversity loss and climate change. Norwich is recognized internationally for its scientific research. It is also world renowned as a hub for the creative arts. Although there is cross-fertilisation between science and the arts in Norwich and the wider region, there is also considerable unrealized potential for synergy. *Translating Science* is a collaborative project between the Norwich Research Park and the National Centre for Writing (also based in Norwich). Its initial aim was to test the water – to take one small step towards a bigger ambition - towards diving in.

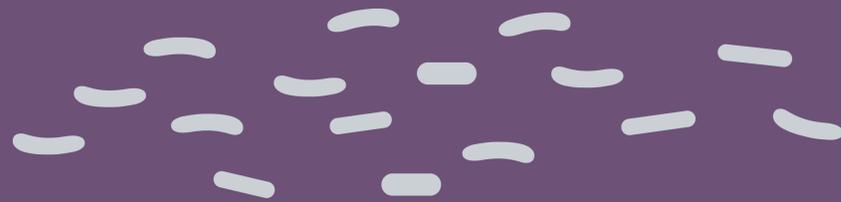
The *Translating Science* project brought scientists from the Norwich Research Park together with established writers, so providing an opportunity for experts within two very different fields of work to collaborate and gain fresh insight and inspiration from each other. At the kick-off workshop, the scientists began by sharing their research with the writers through brief presentations and discussion. This was followed by a ‘speed-dating’ session that enabled the writers and scientists to find out more about each other. The whole cohort (writers and scientists) then took part in some writing exercises, led by Sam Ruddock from the National Centre for Writing. There was a real feeling of excitement in the sharing session at the end of this process, when the creative works were read out. Following an offline polling process, the scientists and writers then teamed up in pairs to begin their adventures together. Each writer was commissioned to write a piece inspired by the research of their partner. The writers were encouraged to position their work within the overall theme of Healthy Plants, Healthy People, Healthy Planet. The process involved a lot of exchange, follow up discussion, and in some cases visits to the research laboratories. The outputs are showcased in this anthology. It is fascinating to see how each partnership led to such distinctive and captivating outputs, and to reflect on how the interaction with the research scientist has shaped the writing.

In its second phase, with the publication of the *Translating Science* anthology, the project aims to engage more people in science by articulating research conducted by world-leading scientists at the NRP in new ways. Readers of short stories and poetry will encounter science-based research that they may not have been familiar with before. NRP science will be opened up as a meeting place – a place of exchange - in new and intriguing ways.

By triggering the readers' excitement and imagination, we hope that the readers will in turn be supported in developing a deeper understanding of the benefits of science-based research for solving the many challenges we face, and help to influence policy and decision makers to make the right choices. The commissions present a positive outlook for the future of our world.

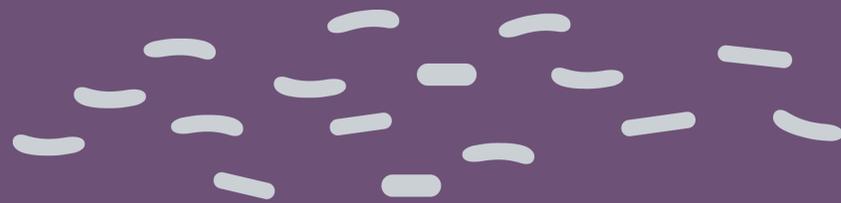
As Norwich celebrates its tenth anniversary as England's first UNESCO City of Literature in 2022, this is a timely project which demonstrates the power of storytelling in our city. We are incredibly lucky that the Research Park and National Centre for Writing both call Norwich home.





IT COMES THROUGH THE AIR - A CONTRAPUNTAL

by Heidi Williamson
with Dr Vincent Were



'The rice blast fungus Magnaporthe oryzae is a textbook example of a rapidly adapting pathogen...'
Pierre Gladieux, American Society for Microbiology, April 2018

like any organism
it just wants to survive
it creates its own flaw, fissure, fault
to enter the host, open

disorder
endurance fits
gaps
deepen

low and gentle at first
the pathogen steals in, sidles
into and pegs itself among
cells, through walls
into next cells
not a prison, but a field
enclosed but borderless

quiet, slow
transfers
the timeline of
perspectives and
framework
that breaks out
and merges

the exact point at which everything
escalates is unspecified
the disease knows its business
and executes it

complicates also
coverage unidentified
which discharges
irreversibly

when I say poor weather I mean
the opposite of rain
hot, dry, thirsty
your collar too tight, your neck
itchy, shockingly choked,
your survival quieted

lack
of hydration
parched
weakened
lessened
plagued

its offspring broadcast
it cultivates recurs
it ranges pervades

transmissible
breeding
options

we adapt it adapts
we acclimatise it competes
we evade it contends
we develop it matches

repeat morph mutate
adjust revise change
rework amend defamiliarize
exchange transform evolve

only constant adaptation
can succeed
an ever-evolving
opposing species

compulsion
rupture
transition
invasion

unyielding

the air is unavoidable

increasing
resisting
reducing
vulnerability

virulence
triggers
catching, seizing
contagion

stratagem, attack
avert
durable, communicable
survival

pressure pre-empts
occurrence, incapacity
strikes outcome
inoculum

variable/ variables

negotiable

Notes

The pandemic pathogenic plant fungus *Magnaporthe oryzae* (rice blast fungus, rice rotten neck) destroys crops that would otherwise feed 60 million people each year. It devastates smallholders, farmers and families worldwide, especially in food-deprived countries. Its spread is escalating across continents, and a related disease is a major threat to wheat. Scientific consortiums are urgently trying to curtail it.

A contrapuntal poem comprises elements that are distinct, but in conversation. The intention is to create a reading of dis-ease. The left column creatively tracks blast growth in a rice plant. The right contains words concerned with sickness prevention, occurrence and treatment.

With thanks to Dr Vincent Were of The Sainsbury Laboratory for generous sharing of his research and time.





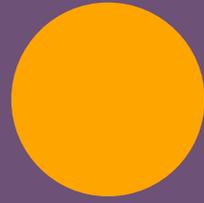
Vincent Were completed his PhD studies in Biological sciences at the University of Exeter and currently works as a post-doctoral researcher at the Sainsbury Laboratory. His research project is geared towards understanding the population biology of rice blast in Sub-Saharan Africa with an ultimate goal of developing rice lines with durable resistance to rice blast disease. He is also using molecular and live cell imaging as tools to analyse effector-host cell interactions during infection and to observe cytological changes. The aim is to determine sets of genes involved in disease process during plant-pathogen interaction, and to gain insight into the function of un-characterised secreted proteins in *Magnaporthe oryzae* and on their putative effector host targets in rice.



Heidi Williamson is an Advisory Fellow for the Royal Literary Fund. She was Royal Literary Fund Fellow at the University of East Anglia in 2018-2020 and 2021. She teaches for the Poetry School, Poetry Society, National Centre for Writing and The Writing Coach. Her first collection, *Electric Shadow*, was a Poetry Book Society Recommendation and shortlisted for the Seamus Heaney Centre Prize. *The Print Museum* won the East Anglian Book Award for Poetry. *Return by Minor Road* (Bloodaxe, April 2020) revisits her time living in Dunblane at the time of the Primary School shooting.
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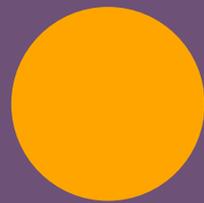






ORANGE

by Megan Bradbury
with Pete Wilde



(i)

It would be easier to drink the juice, just drink the juice. The orange is round. It has a skin. You must peel it. This takes time. Plunge your thumbnail in. The juice will spurt, sting your eye. You need a strong thumbnail and thumb. This isn't going to be a walk in the park. A park is a good place to eat an orange. But what do you do when you have eaten it and your hands are covered in juice? Not just the juice but also the pith, white and sticky? It would be easier to drink the juice. Juice cartons are available from most newsagents. Packaged at your convenience in small boxes. Straws are stuck to the side. You needn't ever touch the orange. You don't have to get it on your hands. You needn't make a mess. When you are finished, you can dispose of the carton in a bin placed specifically in the park for this purpose. You needn't take it with you. You can just continue on your way as if you had never drunk the juice. But the thumb, sore from peeling the orange, will remember peeling that orange, and it will be tired from that, and the effort it took to peel that orange will be absorbed somewhere in the body or will be used to prevent illness in the body, or will simply become part of a memory of this day, how you should have packed a more mobile and less messy fruit, and this memory will become part of the body, just as the structure of the orange in being digested by the body becomes part of the body. The stomach moves with the orange in a way it does not with the juice. This activity is good. This is what the body wants. The body wants the orange, not the juice. The body does not want an easy walk through the park. Let things be hard. You can just pick the orange from a tree and eat it. An orange is an orange.

(ii)

We were told by the institution to keep a diary of reflection.

I wrote,

Soils are the earth's dynamic skin. Vulnerable. They respond to what we do to them.

One scientist in the seminar was nicknamed Doctor Doom because his predictions about the effects of climate change were dismal. Once the moths have gone, that's it, he said. But people won't listen to the story. People won't even listen to the facts.

I began collecting the facts. I asked the scientists what they knew. They spoke about understandings and connections. I realised art and science were the same.

I learnt,

Nutrients are essential.

Foods should be consumed slowly.

95% of what we eat relies on soils. That is, the foundations we lay down.

Food with a complex structure has more to give.

Simplicity is killing us.

We watched a film showing a conveyer belt moving plants slowly through a lab, stopping to commit the plants to different atmospheric conditions. This study showed the scientists how changes in climate influenced the growth of crops. Knowing this meant we would one day be able to predict the best conditions in which to grow our food.

I asked Doctor Doom,

Will this be enough?

I looked at my own face in the small box in the corner of the screen.

The plants are just like us. They need love and the right conditions to thrive.

I learnt,

Research is being conducted into making the foods we eat more nutritious. But it is important the public don't learn that this is being done. If they learn that what they are eating is healthier than usual, they will adapt their habits in response, eat more, for instance.

The process of our study was frustrating. The digital conference technology we were using to communicate kept freezing then raced ahead to catch up with itself. When the connection froze, we did not know who was saying what. Sentences became stuck in the middle. Meaning fragmented then fell away entirely. I heard the echo of a laugh then a tinny stilted voice acknowledging that this process closely resembled the main constraint of both science and poetry: the ability to communicate effectively.

The writing needs to be as active as the science, the organiser said.

Story isn't necessary, a poet said.

(iii)

Now, I find myself looking back. Our diet has become very bland. There are not enough people to pick the fruit. Boats used to bring people as well as goods. Now, no boats come. I can't remember a time when I ate something I wanted. Olive groves on the continent are at risk of drought due to climate change. Simplicity is fashionable, complexity out of date. I miss foil wrappers, their bright colours. Fresh produce grows abundantly in Europe, but we have no ships. I have always been told throughout my life that what I needed was greater structure and complexity. People round here keep yelling that they want their country back. I hear the scientists have moved to Europe. When the digestive system breaks down food, it releases nutrients that give us energy. Processes work in conjunction with one another. Starch reacts to fibre, for instance. I wonder if we could have found a way to work together rather than beat each other down. The *body* doesn't work this way. These days, it rains and rains. These days, grain is milled to dust. Butter is spread thinly to make it last. Butter is processed simply, but it is unhealthy. The complexity of olive oil spread was what made it good.

Lost, I try to remember. I remember the scientists said,

The intricacies of elements and contributions

Happy accidents, failed experiments, yielding positive outcomes and useful data

The mask of definiteness

The process of applying for funding can restrict ideas, but it can also liberate them

Frustration – funding creative proposals

Risk averse funding bodies

Perspective – to look up at the rest of the world

There is positivity to be found in failure

Anxiety

The hardest part should be the science, but the hardest part is the communication of the science. We've solved the science, the scientists said. All we need now is for the public to believe us. Science isn't the problem; *belief* is the problem.

People say,

The earth is flat.

No, the earth is round, like an orange.

No, the earth is an irregularly shaped ellipsoid.

We were told,

Diversity will always benefit a system.

But they turned back the people in the boats. Many drowned.

Now, we are waiting. I don't know what for.

We were told,

Our bodies and diet have split apart – the food we eat is situated in the present while our biology is stuck in the past.

But we have not returned to Palaeolithic times, for the soil, these days, is barren.

(iv)

These days, we must make bread ourselves.

The kneading hurts my hands.

The needing hurts my heart.

I must find a warm place where the dough can rise.

These days, my house is cold; gas is expensive. The flour I use is very simple. Whole grains are no longer consumed. This country itself isn't whole; it has split into parts.

Tinned corn contains more nutrients than fresh.

I keep myself warm with the aid of a blanket.

We were told to write our emotions down.

I wrote,

Notes

Pete Wilde researches how the structure of food influences digestion, the release of nutrients and subsequent health impacts.

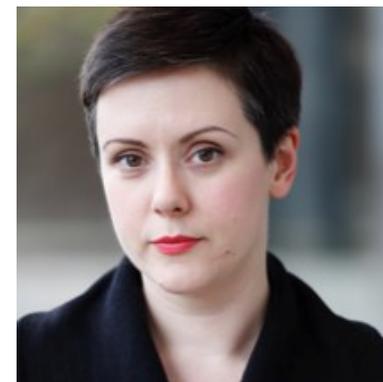
Using structure and complexity as a starting point, 'Orange' considers patterns and outcomes of complexity and diversity within the body, the mind, and in populations.

The body benefits from the complexity of well-structured foods, just as a society benefits from the diversity of its citizens. Blandness and efficiency in both cases can be detrimental to health.

'Orange' is an attempt to untangle (or tangle) this.

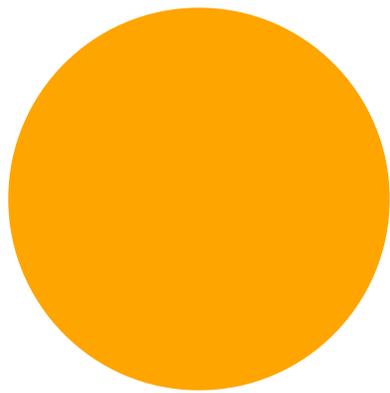


Professor Pete Wilde originates from Yorkshire, graduated in Biophysics at UEA and has lived in Norwich ever since. He began work at the former Institute of Food Research, now the Quadram Institute, investigating the molecular and structural basis of the physical stability of foods such as foams, emulsions and gels. He has since applied these approaches to understanding the nutritional basis of the food we eat. His main area of research is determining how the structure of food influences digestion, release of nutrients and subsequent health impacts.



Megan Bradbury is a novelist based in Norwich. Her first novel, *Everyone is Watching*, was published by Picador in 2016. The book explored the relationship between art, sex and urban planning in New York City throughout the twentieth century through the consciousnesses of leading cultural figures from the city's history (among them, Walt Whitman, Robert Moses, Robert Mapplethorpe and Edmund White). Described as a 'beating heart of a novel' by Ali Smith, and 'one of the best debuts I've read in years' by Eimear McBride, the book was longlisted for the Rathbones Folio Prize and Not the Booker Prize, and was chosen as one of the Guardian's Best Books of 2016.

She is an experienced artistic collaborator and has worked on commissioned projects with acclaimed artists from across the world. She holds an MA in Creative Writing from the University of East Anglia, and she has been the recipient of a Charles Pick Fellowship, an Escalator Award, two writing awards from Arts Council England and one from the Authors' Foundation.





HARDY

by Shey Hargreaves
with Professor Anne Osbourn



Then

In the garden at St Giles, the sisters crush
lavender in their palms before the morning round.
Burn out plague with sage,
gather rosemary to wind the bodies in.
The village women, who do not read,
know nonetheless that a little henbane -
not too much -
can soothe the ache
of worn-out joints.

Now

On a late summer afternoon
the professor and her senior researcher
drive home to Norfolk from Kew Gardens,
a swaying triffid in the back of the car.
Its tendrils softly touch the tops of their heads,
The tips of their ears.
They turn up the radio, and wonder
what green gold
this new specimen might grant them;
its secrets, with curious coaxing
and gentle hands,
unspooling across the greenhouse floor.

Someday

In subterranean cities of permanent dusk,
children learn the litany of past mistakes.
Turn with gloved hands the pages of picture books
shining with green grass, blue sky, glittering sea.
Tend gardens lit by plastic portholes bored up to the surface,
filtering the brutal sunlight
into the little circles of marigold and poppies,
dandelions and cacti,
rosemary and lavender.

The tough herbs
that would not die.

Notes

Professor Anne Osbourn carries out research into the natural chemicals produced by plants. Her laboratory investigates ways to access and synthesise these chemicals, and the natural pathways used to create them, for use in medicine, agriculture and industry.

Shey Hargreaves writes scripts, poems and graphic novels that explore thorny contemporary issues such as climate change and the challenges faced by the National Health Service.

This triad of short poems explores the interaction between people and plants through time. The poems reflect on traditional knowledge of the medicinal properties of plants, contemporary research into plant functions and products, and which hardy plant specimens might survive the potential changes to the planet's climate that lie in the years ahead.



Professor Anne Osbourn's research at the John Innes Centre focusses on plant natural products. An important advance from her laboratory has been the discovery that in plant genomes the genes needed to make particular natural products are often organised in clusters like 'beads on a string', a finding that has greatly accelerated the discovery of new pathways and chemistries. She has also established a synthetic biology platform that provides a new route to synthesize and access previously inaccessible natural products and analogs for medicinal, agricultural and industrial applications. Anne is a poet and also founder of Science, Art and Writing, a cross-curricular science education outreach programme (www.sawtrust.org).



Shey Hargreaves is a scriptwriter and performer working across theatre, film, audio projects and graphic novels. Her most recent live show, Sick, was a funny, honest and bittersweet account of her time working as a receptionist in a busy NHS emergency department. Her first graphic novel, Open Day, was a collaboration between Shey, illustrator Charli Vince, and a group of physicists working on 3D printing with atoms at the University of Nottingham. She is currently working on a podcast, Badger Watching, about two siblings going for walks in rural Norfolk during lockdown. She is one of Norwich Castle's artists in residence for 2021, for which she is writing a new live theatre piece about nurses caring for patients with leprosy in Norwich's medieval hospitals. She lives in Norwich with her wife, three young sons and a tortoise.





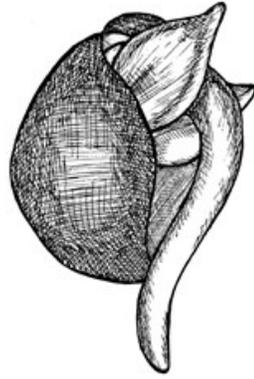
MICROFICTIONS

by Jess Morgan

with illustrations by Dr Bethany Nichols



Fig. 0-1: Germination



Under Ground

at the end i asked how many
vicky came back and said eight. eight.
my lips repeated it and inside i thought about
you

how you're never going to believe this and
i couldn't wait to be back in our little room
made of blue curtain telling you
they told me - keep breathing eight eight

eight
eight

then gave me a cup of tea and about a billion little glasses of water
my chocolate bar tasted amazing
then we were allowed to leave
the clinic

it felt good to be back in my own clothes

(most of the day resting
short walk to the post office)

looked deep into the park today - orange glow and
baby swings

Fig. 3: First Leaves



Ground Truth

Do you remember how to age a hedge? G01 asks. We talked about it last time. But G05 shrugs and says nothing. You can do it by counting the number of species in a thirty yard stretch. G05 scoffs. Yard? Who talks about yards? It isn't really a question he thinks and so G01 doesn't bother to answer. Here looks like a good spot, G01 says. The tree is a good marker. He points at an Oak tree overrun with deep green lobed leaves. Looks healthy. It'll be here long after we've gone! G05 continues to stare through his phone screen. He sees how he uses two thumbs to type, like he had noticed all the young ones do. Far more use to the planet than you or I this fella. It'd take hundreds of years to replace him. G05 shakes his head. He doesn't look up. It'll be too easy, he says, flat. It should be harder to find. In the middle somewhere. G01's eyes search the field, populated with green plants not yet in flower. He sighs. We're not really supposed to mate - it's not our land - we should stay to the edges. Those there, he points, are Brassicas. We mustn't trample them. You know what they are? G05 only shrugs. He thinks they look like weeds. But he gets it. And if he just waits, his dad will tell him what they are, and save him the bother. He goes back to his phone. And G01 explains: This field will be bright yellow in a week or two. You'll know the smell. Let's bury it by the tree. What did you bring to put in it this time? he asks, dropping down to a crouch beneath the Oak tree and unscrewing the lid of a metal coffee tin. They'd hunted caches all over the Orkney islands, after the Neolithic site after Neolithic site had all started to roll into one and the rain seemed like it wouldn't ever end. It'd rescued the trip. And for a while after, they'd both been hooked - hiding containers in the woods and on the edges fields just like this on weekends. But now, the boy was losing interest. The usual rubbish, G05 sighs, as G01 pulls an envelope from his rucksack. A few printed photographs spill out, as well as a smaller envelope. G05 frowns at the pile. And G01 senses it. What if we put something different in this one? G01 says. I brought some things - see - some of your hair! We cut it off when you were a baby. He dangles it in front of G05's eyes, in front of

his phone. Annoyed, 05 pretends not to have noticed the little curl of sandy blonde baby-hair in his face. 01 has more. Your essay on climate change, he starts. But G05 snatches at the paper. You can't put that in! But it was really good! G01 protests, as G05 folds the essay up so tight in his arms that it is hidden from sight. The boy crouches into his knees. His words muffled by his clothes. It's not the right sort of thing, the says, as G01 arranges the collection of pocket sized objects on top of his backpack. You're not allowed to put money in! G05's eyes widen at the small pile of coins weighing down a number of magazine cuttings, and a packet of wildflower seeds. What's the point of that? G05 huffs at the seeds. And it is G01's turn to shrug. Might be a good idea? he says, and grins. I like this picture of us. Do you remember? That summer when you would only wear black. Look at you! He laughs. You were sweating! G05 grabs at the photo in the pile sending a *use less plastic* pin-badge spinning like a tiny frisbee, as coins disappear into the leggy grass. I don't want people to see that! His dad risks his hand on the young man's shoulder once more, saying softly, Put your phone away, please. And the boy does. What if we think of it more like a time capsule. Just for us. But the boy breaks away. We already did that at school. No one even cared when they pulled it up. It was stupid! Just full of stupid things! The whole thing was stupid. His dad wonders what was so bad about it to make his son spit out the word *stupid* that way. But he forgets it. Then we won't dig it up. Not ever? He shakes his head. No. We'll just leave it. It'll stay buried, until the roots of this tree lift up, and believe me there'd have to be some good reason for that. Whispering now, he adds, and we'll probably be dead by then.

Fig. 5: Bolting



Road Trip to Aberystwyth

We used to wear white coats. Bump shoulders. Lend pens. Big Steve used to make cakes, calling them his *experiments*. He had one of those rotating cake stands at home. For icing with a great flat knife, like drywall. The flour still in his beard at nine o'clock signalled he'd been at it all morning. I still think about scoring the parameters of a nice big slice, and pulling it out heavy and slow on the side of the knife, like a small birth. Instead I tear the clear wrapper off a small, very portable cereal bar next to me, same as every day. Tastes like paper.

There used to be fish in the pond. Just there, they say to visitors getting the guided tour, where the paving slabs are much cleaner, – there used to be a Ginkgo tree. A Chinese symbol of longevity, I heard someone replied, just once.

Halfway to the greenhouses now. It's cost me two days holiday. But will still be carried out like an official visit. They will want to give me a clip-on sort of badge. Call me by my title. I only want to smell things and touch what I'm allowed. Hum something, if they'll dare to leave me there for any length of time.

The drive takes me all day. I find I know all the verses of Don McLean's *American Pie*. It had become for a while, our small, private project. Steve used to say *It's about so much more than Buddy Holly*, drying the day's mugs next to me. A spotty boy scribbles something that isn't my name onto the side of a coffee cup. *But what if it is your name?*

He would have planned this trip by train. Brought a Thermos. Be the first to boom *Caws!* as a pre-flowering brassica shunts along the conveyer ahead of having its picture taken and its measurements captured. He would want to count the pods by eye anyway, *un – dau – tri – pedwar* - having learned Welsh especially for the trip, and for the plants as much as anybody. He believed they were deserving of *music* and that they were each multicolour-striped* on their insides, *as we all are*. Wrapped up in tinsel under our coats.

Fig. 6: Flowering



The Tennessean

There is a picture of Elvis Presley taken by George Barker on June 10th 1958, for The Tennessean, hanging in the entrance to RCA Studio B, which is open for the public to take guided tours. The spot where Elvis stood is marked on the floor by an 'x' made from two pieces of blue electrical tape. They change it every other day because it gets so dirty.

At twenty-three years old, he was slight. So much that half the pilgrims, Southern tourists, pushing thick thighs against the metal turnstiles, mourn the opportunity to set another place at their tables and show him what a good meal looks like. These are the ones that notice the photo anyway, though it omits the usual details: shoulder-pads, sequins, swipe of mouth grease the amalgamation of sweat and chicken drumsticks. Young Elvis wears a grey shirt and he is clean lipped and light haired. Caught in a downward glance, at the telling of a joke his pastor would not approve.

The piano player knows it'll be morning by the time he gets home, but it's a good gig for a jobbing musician with babies at home. Elvis' people always booked the second session of the day – so they could go over if they need to, and they always did. It's what the tour-guides will tell you now.

The signal is always just one finger - a fresh take, another pass, load more tape, change the sheet music. His girlfriend is going to kill him, he knows, but he keeps on playing whatever they put in front of him. Soon, he thinks, he'll hand her the money, she'll let him sleep.

The other people in the picture, their arms thick with hair, short shirt sleeves in the Nashville heat, lean on in. To make sure the camera sees the gold band of a college football ring. A Rolex watch counting down the hours until this talented boy belongs not to them, but to the Army. Someone steps out to phone for more tape, more coffee, cigarette smoke gathers thick in the air. Ends pile in a glass ashtray balanced on top of the piano - lid open and the workings exposed.

Fig. 7-8: Pod Growth



Crossover

The kale had gone way over. You said. Hardly bothered these last few days to glance out the window. At the roses that had grown crooked. Weeds risen like small hedges, making labyrinth of our circular patio, fit for a devil with goat-legs. You showed me the heel of your hand as if to push the disappointment long into next week.

That is why when you were out, I snipped off a leaf and put it in the water glass on my desk – to occasionally touch and to pinch because they are so much like baby's hands. What if I go outside and collect all the leaves and spread them all out on our pillows?

Flattened them with heavy books and pushed them through the mechanical arms of a hole-punch. Working day and night at our dining table with a pile of kale leaves, cabbage leaves, the kohlrabi. Until I have sore elbows.

But I have amassed two large handfuls of confetti ready to disperse with abandon over the next pair of strangers I see dressed in wedding clothes – having leapt from my chair, sprinted at the sound of the bells. And afterwards, as thousands of yellow-green specks melt their way back to the earth, I'd slip home through the churchyard, distinguishable only by a blur in the periphery of their photographs. They will think they have caught a ghost.

Fig. 9: Senescence



Drop Off

If you return a key to someone, and they are not at home to take it, you should first put it in an envelope.

Keys are not be spilled about – to become lost – the cause of silent grudges – that last for ages – against even our nicest friends. Keys strewn across the city – the result of a boozy night out – snapped heel – dusted up – absorbed into wet pavements – toilet floors – backseat of the taxi that would finally agree to take us. Keys found weeks later beneath the torn lining of a handbag.

A spare key does much to undo mistrust of the neighbours. Thinning the walls, pulling hard to the left that way we used to look at each other as one click-locked the car and one dragged out the bins. She waters your plants while you are on holiday. You sweep the needles off the porch.

A good key is always ghosted by its sharp stick and twist.

But tells a parent, we are still –

With keys – exchanged – we have loved and un-loved. Added to the bundle; used until painful, pressed back into a hand naked, returns slowly to a former temperature. Change the locks if you have to.

If you return a key to someone, through the letter box, you should put it in an envelope or at the least, a folded piece of paper. It draws the eye, protects it from the dog, softens the landing when it's all finally done.

Notes

This microcollection of microfictions is based on six identified stages of the development of Brassica Napus, researched by Dr Bethany Nichols using artificial intelligence and computational methods to gather trait information.

Each story is separate but connected, and even expressed as microfiction (a story typically formed in less than 1,000 words,) is a long-hand and analogue expression of an idea. I have taken this cue directly from the research data collection method, which I have understood as computers taking pictures of plants at regular intervals, and being taught to measure aspects such as pod growth using pixels. In a sense, its limitations and ‘analogue-ness’ are its strength.

The stories are planted with language borrowed from the research described to me, for example, ‘Ground Truth’ - a term meaning a direct observation by a human, as opposed to artificial intelligence. I have also repurposed a number of fixtures, for example, a striped, tinsel-like graph known as a ‘Manhattan Plot’ and the location, Aberystwyth where plant data is captured by humans (G01, G02, etc) and via computer (C01, C02 etc).

In each of the six new contexts I hope to have echoed both the growth stage of the Brassica Napus and the interplay between research which appears to be structured and computer driven, and the human capacity for joy – not least in the greater hope of understanding how plants might withstand climate change.

“sometimes knowing if something doesn’t work, is as good as knowing something does.”

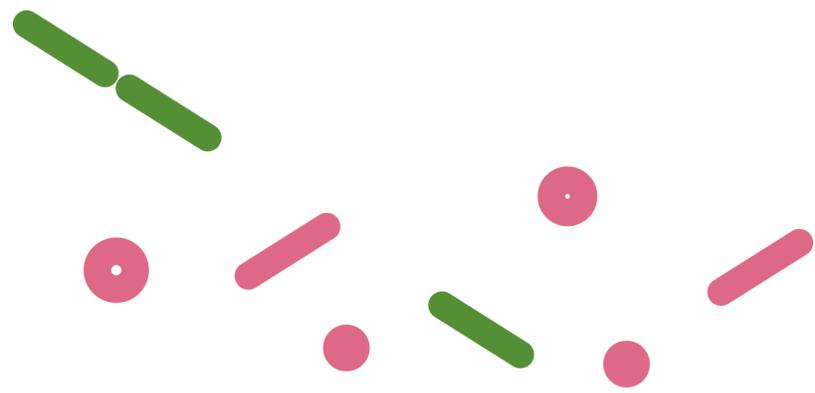
Dr. Bethany Nichols.

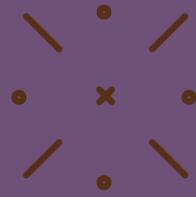


Dr Bethany Nichols is a Computational Biologist and Turing Fellow, working at the John Innes Centre. Using AI and deep learning techniques, Bethany aims to extract plant feature data from images, so that they can be used in combination with genetic data, to unravel the genes regulating Brassica development. Her work is part of the Brassica, Rapeseed and Vegetable Optimisation (BRAVO) project, and will help to uncover how environmental conditions affect plant development.



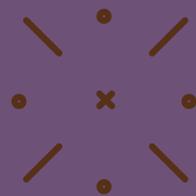
Jess Morgan is a writer and a singer-songwriter from Acle, near Great Yarmouth, who has made a career penning gutsy modern folk song, touring the worlds darkest cafes and just once, the O2 Arena. Jess also has a MA in Creative Non Fiction, was shortlisted for the I'll Show You Mine prize and longlisted for the Hinterland prize for non-fiction. Jess' latest project joining music together with live literature, was backed by Arts Council England and will be developed further in 2022 with the support of the Inn Crowd rural arts programme. Through lockdown, Jess had been carefully drafting her book - about birdwatching and IVF.





FRAMPTON COMES ALIVE

by Ed Parnell
with Jeff Price



This is the place where I saw my first. There it was, feeding distantly on the saltmarsh – an out-of-place vision of the Mediterranean.

Half a lifetime later I find myself staring over the same green-and-brown expanse. Sure enough, though it's largely birdless, I soon locate a little egret on the banks of a muddy creek. Panning across the monotonous vista with my binoculars I detect another, then another, until at least six are in view. Back in 1988 when I watched that lone individual through my new telescope (a recent Christmas present), these small snow-white herons were a sporadic visitor to the UK, and records of sightings had to be sent to the British Birds Rarities Committee to be verified; today the species has colonised much of southern England and, in many places, is a common sight – I even occasionally see them flying over my house, which still causes a flourish of excitement, though they've lost the cachet that their earlier status afforded them. They feed in the stream that runs alongside my neighbour's garden, somehow finding fish in a few inches of muddy water beneath the willows and sycamores, before flapping up to rest on an overhanging bough.

The little egret's highly visible and ubiquitous East Anglian presence acts as an illusion that tries superficially to beguile me into believing that nature must be in reasonable health. But this is not the case.* The evidence from so many of the familiar birds I would've seen in good numbers back then, like lapwings (peewits as my mum called them) and curlews, is much grimmer: in those intervening three decades their numbers – alongside those of so many other wildlife species – have plummeted.

I'm at the RSPB's Frampton Marsh, and in the years since I first visited the reserve has changed immeasurably. I originally came here as a teenager on a spring Saturday with the Lincolnshire Bird Club to help survey numbers of black-headed gulls. The gulls, understandably, were annoyed by our presence, deserting their grass-strewn nests on the marsh to hover tetchily above our heads. Later I came in the dead of winter with my brother, the pair of us wandering desolate miles along the sea wall. Once we watched a Lapland bunting on the bank of the River Witham, and on another occasion an even-rarer arctic redpoll that had joined a flock of twite.

The memory of those stray songbirds from the north today seems like a dream.

Despite the ubiquitous wind – I don't think I've ever visited this part of The Wash when there hasn't been a stiff breeze – it's a pleasant autumn afternoon and the sun is out. As well as the egrets on the marsh itself, there's a flock of spoonbills on the new, reedbed-bordered lagoons – the distinctive, statuesque birds, as well as the pools themselves, are both features my teenage self would have struggled to imagine as something that would one day form such a feature of this landscape.

The RSPB purchased the marsh in 1984 to protect the black-headed gulls, as well as many species of wading birds, including notable numbers of redshanks; a few of those are present today, noisy as always. Later, the surrounding farmland was acquired – boundless flat fields butting up to the bank that

* The presence of the egrets, Jeff Price points out to me, is actually an indication that nature, given enough opportunity, can adapt to some, small changes – this is the expected adaptation. As to whether they will be able to keep up, he says, is another matter.

separated the marsh from the more-solid world – part of an ambitious scheme that got underway in 2005 to create an expanse of wetland.

In 2021, this new habitat has become well established and vast in its scale. It reminds me of the kind of wilderness haven you might find on the Continent; I still can't believe it's only a few miles from where I grew up. As I look over, the spoonbills are strung out in a loose line across the middle of the largest lagoon. For once they are active and not lost in head-hidden slumber, sweeping their spatula-like bills through the invertebrate-rich soup of water and mud. I could be in Texel on the Dutch coast, I think to myself, not a few miles outside Boston. The spoonbill is one of the species that the ornithologists and scientists who are modelling the likely effects of climate change on the natural world think is likely to follow the little egret and expand its range and numbers in East Anglia, as well as other areas of the British Isles. Already, a colony exists on the north Norfolk coast, while similar pioneering white waterbirds – the great white and the cattle egret – are following suit.

Other exotic avian visitors may also become more regular as our local temperatures rise, including several birds of prey, such as the honey buzzard, black kite, and Montagu's harrier; the latter having previously been a very scarce breeding species hereabouts, though always on the limits of its range. Back in my teenage years a pair of the beautiful, sleek raptors nested just along the coast in a patch of scrub behind this same sea wall. I have a time-slowed memory of the silver-and-black male passing close by my mum's Ford Escort, which we were peering out from, as the harrier brought food to its hidden mate. The species is named after the naturalist George Montagu (1753–1815), author of a famous Ornithological Dictionary of 1802, who recognised that two similar smaller harriers occurred in the UK – the hen and his own namesake – and cleared up that the brown female and immature birds were not, as commonly supposed, a separate species from the silvery males. The Montagu's harrier is today the rarest of our breeding raptors, having virtually disappeared from the UK. One of the few positives of a warming world might be its return, alongside that shift northwards of other Mediterranean birds. The list of what might be lost, however, is frightening – appearances by those Arctic-originating Lapland buntings and redpolls seem far less likely if temperatures continue on their current pathway, and the flocks of twite that were a regular winter spectacle when I came here in my youth seem, even now, virtually confined to history. Even more sobering is the roll call of insects that, before long, may no longer flutter through these big East Anglian skies. Or the list of so-familiar trees – including silver birch, goat willow and horse chestnut – that will find our climate unsustainable if temperatures rise at a level approaching that of scientists' well-grounded fears. The thought makes me feel conflicted about my enjoyment of the new natural spectacle playing out on the lagoon.

Fear and paranoia were staples of growing up during the late 1970s and early 1980s – though back then it wasn't an over-heated planet that fuelled my anxieties. Still, I cannot help feeling that my current fears of a burnt-out, wildlife-stripped (or wildlife-modified) world are grounded in similar formative feelings.

I was born as Edward Heath was announcing the Three-Day Week, and though I have no recollection of the power cuts my infant self must have lived through during that period, I do have a memory from towards the end of the decade of my mum, brother and me playing a Space 1999 card game by torchlight on the living room floor: thrills didn't just come from the birds Mum pointed out on drives around the local lanes – science fiction also held an attraction.

As well as a fear.

Like that I experienced while watching the 1981 TV reworking of John Wyndham's post-apocalyptic novel *The Day of the Triffids*. It wasn't so much the human-dwarfing plants themselves that got to me, but the opening of the story when the protagonist Bill Masen realises he has dodged the blindness that, overnight, has affected the majority of the population who were out enjoying the marvels of an overhead meteor shower. (We learn later of a theory that the dazzling flashes are the result of rogue radioactive satellite weaponry, which may also be the source of the plague that scourges the survivors.) Yes, the triffids themselves – particularly their hissing, rattling sound effects – were disturbing, but they paled beside the thought that you could potentially lose your sight from looking up into the sky.*

Although bleak, Wyndham's prophetic future vision did at least offer my childhood self the exciting prospect of dodging overgrown rhubarb plants in the post-apocalypse world. A visit at a young age to my dad's office provided similar warnings of agriculture gone awry – numerous public information posters decorated the entrance stairwell depicting Colorado beetles that looked like something out of a '50s B-movie (though in reality the invasive stripy potato pests are only a centimetre long), or slavering bare-fanged rabid dogs ready to jump off foreign ships at the first chance. If not triffids, then perhaps it would be a topsy-turvy universe where monkeys ruled – the world of one of my favourite films, *Planet of the Apes*, which I'd always try to catch whenever it was shown on the telly.

Contemporary 1980s portrayals of how we were all going to die were generally more down to earth: it would happen as a consequence of a US–Soviet thermonuclear war, an agonising death from burns or a lingering slow passing from radiation sickness in a grim, conflict-blackened England. This was the future according to *Threads*, first broadcast on the BBC in September 1984. Scripted by Barry Hines, better known as the author of the novel *A Kestrel for a Knave*, the made-for-TV feature is a grimly plausible foretelling of how the country might fall apart after the bomb. Its opening credits show

* It turns out I unwittingly shared a common childhood fear of blindness that Freud notes in his 1919 essay 'Das Unheimliche' ('The Uncanny').

a garden spider spinning its web, an unsettling metaphor for the brittle ‘threads’ of the title that hold society together. Set in Sheffield, the ordinariness of the film’s location is where much of its power came from – viewers everywhere could relate to and identify with its characters and setting.

I didn’t watch *Threads* at the time, though I think my parents may have done: it’s a boyhood viewing experience I would not have forgotten. My own fears back then were less unremitting. Certainly I was scared of dying in a nuclear war – and it was a genuine fear – but I’m not sure I believed it would ever happen. The visions I had were pieced together from the aforementioned sci-fi triffids and man-monkeys, or from slick Hollywood movies like Matthew Broderick’s 1983 *WarGames*, in which a military computer simulation goes wrong and conflagration is only avoided at the last moment by an unwinnable game of noughts and crosses.

There’s nothing remotely Hollywood about *Threads*, though. Nothing is sugar-dusted, least of all its use of excerpts from the UK government’s actual series of civil-defence public information films, *Protect and Survive*:

‘If anyone dies while you are kept in your fallout room, move the body to another room in the house. Label the body with name and address and cover it as tightly as possible in polythene, paper, sheets or blankets.’

I attempt to watch *Threads* now – the fact that I’m the same age as my dad would’ve been when it was first shown seems significant. I find myself struggling to make it to the end, because it’s a powerful piece of drama that, to an adult viewer, induces visceral terror. The on-screen appearance of the first mushroom cloud over Sheffield city centre wrenches at me and, when the second wave of warheads fall, giving way to images of melting milk bottles, charred corpses, a half-dead pet cat rolling in the rubble, and the likeable characters who we’ve come to know over the film’s first hour left soiling themselves or disfigured and moribund by the blast, it’s hard to keep going. On seeing the deathly cloud rising over the Steel City the main character’s best friend says, in a resigned echo of the last line of *Planet of the Apes*:

‘Jesus Christ, they’ve done it. They’ve done it.’

Later, we see the next generation of children, feral and half-dead from starvation and the ravages of radiation, viewing a warped VHS of an episode of *Words and Pictures* in a bare school hall – an educational programme I remember myself being shown at primary school. The flickering visuals show the female presenter jauntily addressing her hollow-eyed audience in a chilling, prescient prediction of their own near-future:

‘Skeletons and skulls of different creatures. We borrowed them from a museum!’

Threads is one of those cultural artefacts that gets widely referred to now as representative of a generation’s fears, a programme we all apparently watched and then discussed in the playground. It’s easy to accept this as fact, but I don’t think it’s entirely accurate – I suspect at the time the film’s reach and impact was more restricted. Certainly, in my case, I was (whether wittingly or unwittingly) sheltered

from it – a good thing because, despite my burgeoning love of the terrifying and the macabre, this would have been too dark even for me. It is now, certainly. But there are other touchstone works from the time that did have a similar effect. For my partner it was Robert Swindells’ novel *Brother in the Land*, which she studied for pre-GCSE English and still talks about with a shudder; it’s another British-set portrayal of the breakdown of society following a nuclear conflict, and features a teenage protagonist, Danny, who is trying to survive the literal and metaphorical fallout. I ask her to describe it.

‘I just remember the radiation sickness and everyone’s hair dropping off in clumps,’ she says. ‘It was grim.’

For me, the book that brought home the reality of what atomic warfare might mean was Raymond Briggs’ 1982 graphic novel *When the Wind Blows*. My brother, six years my senior, bought a copy on a family summer holiday to the New Forest, and I read it after him. I was already familiar with Briggs’ *Fungus the Bogeyman*, which appealed to my sensibilities of the time, though that book had given me no warning of what was to come over the following 38 pages. *When the Wind Blows* featured the same two characters from Briggs’ previous title – Jim and Hilda Bloggs, a simplistic working-class couple with an endearing relationship – the achingly sad Gentleman Jim. We get to see their gently comedic preparations for the possibilities of the impending bomb, realising as readers what they don’t: that trying to survive the effects of the bomb is futile. Like most of Briggs’s work, there’s a bittersweet tone. Jim constructs a shelter by following the instructions in his public information leaflet and resting three removed doors at an angle against the lounge wall, though Hilda points out the impracticalities of remaining inside the makeshift structure for the requisite two weeks:

‘And what about the toilet? I can tell you now, James Bloggs, that I am going to go upstairs in the proper manner.’

When it comes, the blast itself is eloquently effective: a spread in which we can see the ghost of the cartoon strip bleached out below the searing pink-edged heat of a blank double page. Overleaf the colour returns only gradually, from white to red before finally regaining Briggs’s favoured palette of dingy greens and browns in the bottom right-hand corner. ‘Blimey,’ says Jim, and the couple go about trying to reconstruct their existence according to the rules laid down in the official leaflet; Jim’s faith in the government to look after them is touching (‘The Powers That Be will get to us in the end...’), but even I as a ten-year-old boy could see that was misplaced, that no-one would be coming. Over the last few pages, the couple’s appearance gradually deteriorates, the colours acquiring an ever-more *Fungus the Bogeyman* feel as the radiation takes its toll. We leave the pair in the darkness of their shelter, saying their good-natured prayers, unaware of their inevitable, soon-to-come fate.

Like the way we are living our lives now, I think.

But then I look across at the scene in front of me: the swirling flocks of wading birds on the pools where, less than two decades ago, stood only acres of sterile farmed fields. And, in an instant, the

spoonbills take to the sky, their elongated necks stretching before them like compass points as the flock rises together towards the northern horizon.

Despite our immediate, all-too-real fears, we still can cling to some semblance of hope. Can't we?

Notes

This piece has been written in response to the work of Dr Jeff Price, a Fellow of the Royal Geographical Society and Associate Professor, Biodiversity and Climate Change at UEA's Tyndall Centre for Climate Change Research. As coordinator of the Wallace Initiative he has overseen the modelling of the potential impacts of climate change on 130,000 terrestrial species.

Jeff and I have a shared love of birdwatching and science fiction – when I first met him online his virtual background was a still from the 1972 environmental science fiction film 'Silent Running' – so I thought it appropriate to try to bring these themes together in a piece that touches on one of the main tenets of Jeff's research.

The presence in the background of the COP26 talks while I was writing this – waiting to hear whether world leaders might finally begin to tackle climate change and all the other ticking environmental timebombs – also played into the mood of the piece, as did the ongoing Covid pandemic; the subsequent, rather half-hearted conclusions of Glasgow have not done much to allay those fears for the future. Yet nature's apparent resilience in the face of all this human hubris and indifference does still lend me some optimism. Indeed, even as I type these words, from the corner of my sight an impeccably timed distraction of familiar white feathers flutters up into one of the willows that borders my garden.

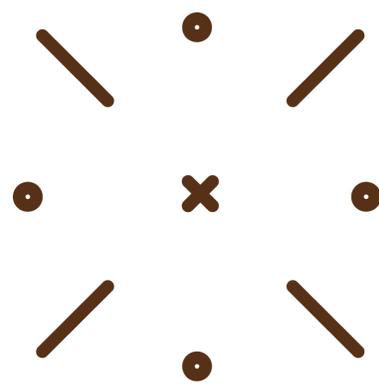


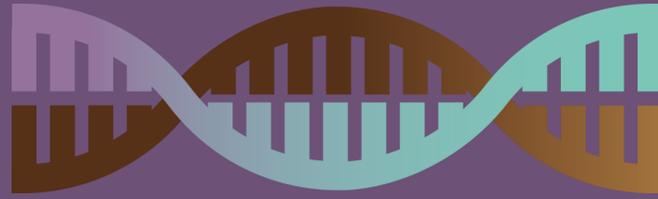
Dr. Jeff Price is a Fellow of the Royal Geographical Society and Associate Professor, Biodiversity and Climate Change at the Tyndall Centre for Climate Change Research, University of East Anglia. As coordinator of the Wallace Initiative he has overseen the modelling of the potential impacts of climate change on ~130,000 terrestrial species. He was a Lead Author on multiple IPCC Assessment Reports, for which he shares in the 2007 Nobel Peace Prize. His paper on the potential impacts of climate change on the birds of Colorado features in the murder mystery 'Death of a Songbird' by Christine Goff.



Edward Parnell has an MA in Creative Writing from the University of East Anglia. He's been the recipient of an Escalator Award from the National Centre for Writing, and a Winston Churchill Travelling Fellowship to fund a research expedition to the Australian Outback.

The Listeners, his first book, won the 2014 Rethink New Novels Prize. His latest book, Ghostland (William Collins, 2019), is a work of narrative non-fiction that was shortlisted for the PEN Ackerley Prize 2020 for memoir and autobiography, and for the East Anglian book awards. Edward is a keen birdwatcher and naturalist, which also informs his work.

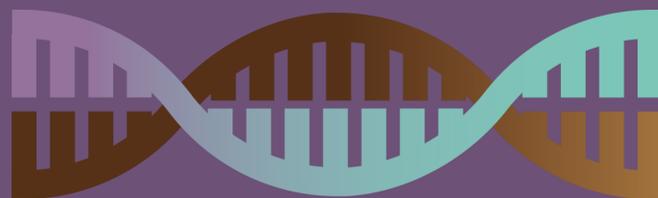




SOIL HEALTH

TRACES OF A BEGINNING

by Vahni (Anthony Ezekiel) Capildeo
with Dr Nasmille Larke-Mejía



Extreme Environments

do you mean shouting
i mean pressure

do you mean competition
i mean petroleum

do you mean war
i mean acidity and alkalinity

do you mean die
i mean go dormant

do you mean sleep
i mean live

do you mean survive
i mean flourish and thrive

do you mean exceptional
i mean expected

you mean expected things
doing the unexpected

think of yourself like a microbe
think yourself into the microbiome

Monoculture of a Verse

Instructions

Acquire a text. You may discover, seize, or 'find' it.

Found text

There is a garden in her face
Where roses and white lilies grow
A heav'nly paradise is that place
Wherein all pleasant fruits do flow.

Clean the soil before monoculture.

There is
Where
 is that place
Where

- *But you've killed everything that's there! Too many chemicals.*
- *Not enough chemicals.*

PIN IT geolocate ENCLOSE survey NAME
tea floribunda damask allergens no thorns tall stems
eliminate allergens good sounds good PIN IT geolocate
there is a market there is a market for if you don't bruise

- *It should be exactly the same, now I've put the seeds in.*
- *Seeds that perhaps aren't growing?*

Tell me again about a deliberately green and distinctive area
Where the human eye has fallen in love with funerals
And tell me how to find it because I own it, sweet, sweet,
And have never been there though I can taste it, unforgivable.

Add something that might kill everything: fertilizer, overwhelming the soil. You will see only what can resist high amounts of toxins. Overwhelming numbers of those.

- *Overwhelm the soil.*

The soil is overwhelmed.

What will you do with it?

Nothing grows.

Neither the lily, nor the rose.

What will you do with it?

An earthly miracle was that skin

Where breath begins as all renews.

The soil is overwhelmed.

The Scientist's Tale

In the vicinity of desert
might be air conditioning.
An emperor might ask his daughter
about her heart's desire –
where did she see her future?

In extreme environments, Papa.
Older, in the absence of desert,
I'll miss my hi-vis clothing,
bright yellow, small in a big, big hole,
fragranced with gasoline, not jasmine.

In the vicinity of mountain
can there be gendered expectation?
Might an emperor ask his daughter
about her self-reflection –
how does she face a future?

Five years at the computer, Papa,
in a room without colour,
facing colourful paper,
I'll think of myself as a microbe
and of the soil's living structure.
The soil is our skin!
I learn all the time.

Things do what you don't expect them to.
Which are you, Reader?
Soil, microbe, emperor, child?

Life Forms Use Things That Are Non-Conventional

Five Things a Poet Took for Granted

1. That Norwich is honeycombed with tunnels
2. That rivers are diverted beneath Milan
3. That everyone once was a child and every child once held a whole fruit in their hand
4. That sapodilla fruit contains natural chewing gum and extra white worms
5. That some people aren't in history and some places just happen to look how they look

Five Things that Freaked Out a Poet

1. That mining explodes the whole cortex of the earth
2. That some people will live near explosions until forcibly moved
3. That you would go back to look at nothing
4. That something is present in abundance where you looked for nothing
5. That explosive-eating bacteria are feeding on the explosives that blew up the mines

A list is a conventional form for a poem.

Conventional farming may lead to a point of no return.

Porosity

you learn in school
little scuttling things
breathe through spiracles
you learn the skin
is the largest organ
of the human body
you won't polish
your toenails
in case your toes can't breathe
but, child,
who says
the soil has porosity?
emotion seeps into me
as I see the field
in which one thing
then nothing
can grow
the saying goes
may the road rise up to meet you
which big man says
soil, rise up, breathe, and live?
I feel myself crumbling
as the earth should crumble
but does not
a myriad creatures
continue their glad ways
in my gut
yet the soil microbiome
the skin of the earth
and its innards
have no words
for their breathless
their hardly recuperable state

Crop Rotation: A Nursery Rhyme for Sustainability in its Infancy

Send little goats through the weeds.
Poo, little goats, have a poo!

Since abundance is not diversity

Giving the soil what it needs
Send little goats through the weeds.

For abundance is not diversity

Living soil brings forth lively seeds
Replenished by a lagoon.

For enrichment is not toxicity

Send little goats through the weeds.
Poo, little goats, have a poo!

And enrichment is not toxicity

Notes

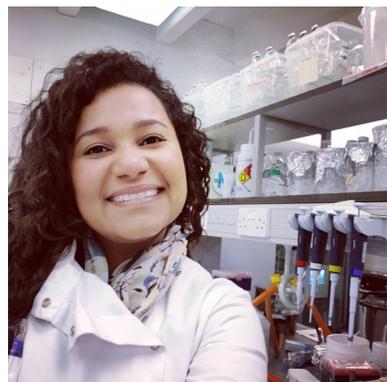
Healthy soil is 'alive', with a diverse microbiome, an array of interdependent life forms and systems that lead to mutual flourishing and efficiency. Sadly, when soil is 'cleaned' for monoculture, the intensive farming of one crop, this damages and even kills the microbiome. The result of such cleaning is that more and more alterations have to be done to the soil for it to be capable of growing enough for harvests. Yet, eventually, the soil will be too dead to yield anything much.

However, life forms behave in unconventional ways. Some bacteria have evolved to eat the traces of explosives in soil. And soil health can be helped along by simple means, like introducing little goats to the environment. This gives us hope of finding ways to restore the microbiome and restore soil health.

Nasmille Larke-Mejía's work ranges from fieldwork in 'extreme environments' to computer-based advanced interpretation of data. I was inspired by the mix of homeliness and complexity in Nasmille's work and life. This moved me to write a sequence of poems in both experimental and simple forms. These poems range from the fictionalized story of someone growing up to be a woman scientist, to mock-instructions for soil cleaning or soil killing, a happy nursery rhyme of simple remedies, and a lament for the soil.

I hope this variety of approaches will interest different people in the question of soil health, that we depend on although we overlook it.

With thanks to Nasmille Larke-Mejía's of The Earlham Institute for generous sharing of her research and time.



Dr Nasmille Larke-Mejía is a Postdoctoral Scientist on the GROW Colombia project working in the Agricultural Diversity Programme at the Earlham Institute. She focuses on studying the microbial ecology of soils associated to different crops (sugarcane and coffee). Nasmille is an Environmental Microbiologist, specialized in the use of cultivation-dependent and cultivation-independent methods to study the microbial ecology of microorganisms in the terrestrial environment.

Nasmille finished her PhD in 2018 at the School of Environmental Sciences, University of East Anglia, working on characterizing soil and phyllosphere microorganisms that use isoprene as their sole source of C using techniques including stable isotope probing, amplicon sequencing and metagenome analysis.



Vahni (Anthony Ezekiel) Capildeo FRSL is a Trinidadian Scottish writer of non-fiction and poetry. After completing a DPhil in Old Norse and translation theory, Capildeo worked at the Oxford English Dictionary, in culture for development (Commonwealth Foundation), and in academia. Their eight books and eight pamphlets include *Measures of Expatriation* (Carcenet, 2016) (Forward Poetry Prizes Best Collection award). Capildeo's interests include silence, plurilingualism, site-specific themes (especially poetics of time in place), and performance traditions and practice. They are Writer in Residence and Professor at the University of York, a Visiting Scholar at Pembroke College, Cambridge, and an Honorary Student of Christ Church, Oxford.





GUT IT GROWS!

by Alexander Gordon Smith
with Federico Bernuzzi



Chapter 10

The institute's brightly lit cafeteria was just as he remembered it.

And so was Peggy.

Sam watched her eat, watched her pull the crusts off her bread and arrange them on her plate, watched her pick at the label on her bottle of Coke Zero while she studied the quiet little dioramas that made up each table. It wasn't just the world that had broken, he thought. Time had, too.

"So," she said, her hand shielding her mouth. "You ready to tell me why you called me out of the blue? After all this time? Why you're suddenly so interested in my work?"

"It's..." Sam started, realising he should have at least rehearsed this bit. "It's for a project I'm working on."

"Another trip?"

He shook his head, seeing Seb, seeing what was left of him, hearing that infernal whisper from the dead man's throat and somehow finding the words even though there could surely be no space left in his mind for them. What had happened was just too big.

"I remember you telling me we had these things in us, these bacteria or whatever. That they joined us or communicated with us or something. You used to use that quote. No man is an island."

Peggy laughed, working down the last bit of sandwich. Sam wanted to fill the silence with something else but she held up her hand to ward off his impatience.

"Shows how much you were listening," she said eventually, running her tongue along her teeth. Her fingers rested on the plastic sandwich pack, popping it again and again and again, like she wanted her words to have a beat. "I never used the quote. I think the quote is bullshit. I mean, maybe not in the way John Donne said it. It's been a long time since I studied poetry."

He wanted to tell her it was Shakespeare, but he couldn't remember if that was right.

"But an island's a pretty good way of looking at it. You are an island, and you think you're living there on your own but you're not. You're part of something much bigger. You're not alone, Sam. Not ever."

"What do you mean?"

Peggy gestured at him with her free hand, the sandwich packet pops dying out, making the cafeteria seem quieter than it should be—only for a few seconds, though, before they started again. It was one of the things that had driven him crazy, he remembered. The noise, the relentless movement. She'd told him it helped her think, but how she'd done both at the same time was anybody's guess.

"You," she went on. "This island that you call Sam Hill, this self-proclaimed mono-entity that walks around like god, like his strings aren't pulled by a trillion other things—things whose collective

intelligence, I might add, is significantly greater than his own.”

“Look, Pegg, you’ve lost me,” Sam said. “And I know you always thought I was too stupid to know when I’m being insulted, but honestly, I’m pretty sure that’s what’s happening right now. I didn’t want to upset you, I just asked you for your help.”

And just like that he felt the panic roll back into his chest, the dread of those endless, empty evenings together, the separate beds, the wordless, aching lonely mornings that they would spend shoulder to shoulder but miles apart. It mixed with the horror of the jungle, too much for him to carry, and he stood up, his chair rocking onto two feet behind him, almost falling.

“It doesn’t matter,” he said. “I’ll find someone—”

Peggy’s hand left the sandwich packet and landed on his, colder than he remembered it being—as cold as Pasco’s had been, standing outside Seb’s tent. She was wearing a ring on her middle finger, he noticed, one he’d never seen before. The stone was an Angara oval, a universe unwinding inside it.

“Sit down,” she said, squeezing gently. “I’m sorry. It’s just weird, seeing you like this.”

He returned to his chair, shunting himself back beneath the table with a chorus of painful screeches that turned the heads of the last few people who remained. Peggy squeezed his fingers one more time then sat back, folding her arms over her chest. Her ID badge caught the light and he saw that she’d changed her name. Of course she had, why wouldn’t she? And yet it still stung. The rings had gone. The name had gone. His stuff had gone, because she’d bagged it all up for him and lobbed it down the stairs nearly a year ago. All that was left was her, which was all there had been when he’d first met her. She’d come full circle. He’d fallen down a hole.

“I meant it about the island,” she said. “What you think of as you, this autonomous, independent being, is a fallacy. It’s just not real. You’re not made up of one organism, you’re made up of an uncountable number of them.”

“In the gut, right?” he said. “That’s what I was asking about, those bacteria.”

“Right. But it’s not just bacteria. You are packed full of fungi too, and viruses. They’re inside you right now, inside everyone. In your intestines, on your skin. And you want to know the weird thing? There are around thirty trillion human cells in your body, but there are over forty trillion bacterial cells.”

“What?”

“Yeah, you’re more bacteria than you are Sam. There’s about five kilograms of them nesting there as we speak, this engine of living matter that occupies this island. As far as they’re concerned, they own the real estate. It’s theirs. You can’t kick them out, and you wouldn’t want to, either. If your microbiome dies, then the chances are you will too. Maybe not straightaway, but eventually. These bacteria keep your gut healthy, your heart, your brain. They keep the bad microbes away. They keep the island afloat.”

“Okay,” Sam said, leaning across the table. “This is good. This helps. But these gut bacteria, they can’t take control of the island, right? They don’t ever pilot the ship?”

“Metaphors are getting a little confusing here,” Peggy said. “And the short answer is we don’t know for sure. But there’s growing evidence that they might. They’re a voice, a loud voice. Even though they’re small, you start singing a song with a trillion other voices then something’s going to hear you.”

Or sing a song with a whisper, he thought, hearing Seb.

Hearing the thing that had stolen his voice.

“Bring it back a bit,” he said, feeling the sweat squeeze through his pores even though the air con was arctic. “You have no idea how tired I am.”

“This is going to be hard to dial back to your level, but I’ll try.”

And she frowned, as if she hadn’t meant for that meanness to surface.

“These microbes can interact with immune cells in your gut,” she said. “In a few different ways. They have a conversation. ‘Hello Mr Immune Cell, how are you today?’”

“You might have dialled back too far.”

She laughed.

“And these immune cells make what are called cytokines. Like a message in a bottle that travels through the blood and eventually reaches the brain. We’ve found gut bacteria in the brain, we know this happens. What we don’t know is what these messages are trying to do.”

“They’re telling us to eat more broccoli, right?” Sam said. “More yoghurt or whatever. What else would they need?”

Peggy shrugged, studying Sam like she’d only just realised who she was talking to.

“Why is this so important?” she asked. “Why now? And why me? I thought I’d be the last person you’d talk to about this.”

Sam glanced across the cafeteria to where the car park sat, drowning in sunshine. A couple more cars had arrived since he’d sat down with Peggy. Was it them? Were they following him? He hadn’t done anything wrong by coming here. Not really. He hadn’t said anything.

“I can’t talk about it,” he replied, his voice low. He stretched further over the table, his chin practically resting on it, but when he opened his mouth to whisper he found that there was nothing there. He pulled back, breathing in through his nose, filling lungs that felt like they’d been empty for weeks. “You just have to trust me.”

And he knew it was the wrong thing to say even before she coughed out an angry laugh. He lifted both hands in an apology that bordered on a hallelujah.

“I’m sorry, Pegg.”

She picked up the sandwich pack, compressing it between her hands as thoroughly and methodically as a car inside a crusher. She held it there, still studying him, as if he was a sample inside one of her petri dishes.

“To answer your question, there are studies that are looking into whether the gut microbiome can

influence your health. Conditions like autism, epilepsy, depression, they can all be influenced by what goes on in the gut. I'm not sure if I believe it yet, but why would it be any other way? These things aren't some foreign invader, they don't come and colonise your island. They are the island. They are you. You can't separate them from this thing that we believe to be our one, true self."

She looked at the ceiling, her tongue running along her teeth, searching for something.

"They're right there with you until you die, and—and forgive me, because I'm going to mix the metaphors again—they're the ones who pack up the show. When all is said and done, when you take your last breath and your brain unloads that final dose of DMT and your soul dreams its way into whatever comes next, these dutiful little workers that have kept you alive and kept you healthy and kept you smiling spread through your slow veins, your silent arteries, and they begin to dismantle you."

She turned her attention back to him, her eyes glassy.

"What a job that must be, eh? To pull down the walls around you, to shutter the windows, to switch off the lights. Goodbye, Sam Hill. Goodbye, Peggy Sunday."

She stared at the table, lost somewhere that Sam couldn't follow.

"They basically eat you," she said.

She dropped the sandwich pack onto her plate and it began to expand, as if it was trying to repair the damage that she had done to it. It looked almost like a time-lapse film of a flower blooming, each translucent facet pushing out from the core, straining to return itself to where it had started.

It looked like Sebastian too, of course. It looked like the thing that had birthed its way out of the old man's mouth, his eyes, his nose; the thing that had bulged wetly into the forest of his beard, folding neatly into his eyebrows; the thing that had maddened him, blinded him, choked him, then reached out as if to draw Sam into some pelagic embrace.

The thing that had sung to him in an old man's voice.

"You never answered my question, Sam," said Peggy. "Why now, and why me?"

The canteen was emptying out, something unspoken spreading from their table, the same subsonic volcanic rumble that scatters the birds from the trees. Sam turned to the window again to see a big, black car stop right outside, the driver bleached by the sun.

"I just need to know one thing," he said. "Then I'll go, I promise. The microbiome, those bacteria and viruses and whatever. Is there something that could, like, change it? Make it multiply, grow out of control. Make it, I don't know, take over?"

She opened her mouth like she was about to laugh, but she didn't.

"What's happened?" she said. "This is something to do with the expedition, isn't it?"

"I don't know," he said. "But it's bad, Pegg. Sebastian's dead."

The shock of it was physical, like she'd been struck.

"He fell, when we were in Vale do Javari. We found a burial site and he fell into it. But that's not

what killed him. He..."

Car doors slamming, and when Sam turned to the window he saw them there.

"Fuck," he said. "I'm so sorry, I shouldn't have..."

He stood up, and this time the chair clattered back.

"Just go, Pegg, just get out of here. I didn't think... I didn't think they'd follow me."

"Who?" Peggy said, looking over his shoulder. "Sam, you're scaring me. Who's following you?"

He didn't need to answer. The doors of the canteen opened and Gribble strode in, the same broad smile, the same cold eyes. He wasn't alone this time, and the men who positioned themselves by the exit didn't look like they were here for their lunch. Sam held up his hands like he was at gunpoint, knowing that this was somehow much worse.

"Look," he started. "You didn't give me any choice."

"What I gave you was the absolute definition of choice," Gribble said. He stopped by the table, taking off his glasses and cleaning them with the lining of his jacket. He looked tired, Sam thought. He looked like a man who'd forgotten how to sleep. "Choice one, stay with us, don't leave, help us find out what the hell is going on. Choice two, go home, lock the door, don't open your mouth to anyone."

"I don't know what this is, but I don't want any part of it," Peggy said, pushing herself up.

Gribble sighed, like he was genuinely upset. He slid his glasses back onto his nose.

"I'm very sorry, Miss Sunday, but you're all out of choices."

"Hey, I didn't tell her anything," Sam said. "Just let her go."

"You don't have any right to be here," Peggy said, fumbling for her phone.

"Don't make me say it," Gribble muttered. "It makes me sound like such a dick."

"Say what?" Peggy said, desperate now.

"That it's for national security," Gribble finished. He looked back, an unspoken command that called two of his dogs to the table.

"Sam?" Peggy said.

And what Sam wanted to do was help her. What he wanted to do was beat the shit out of the men so that she could get away.

What he did, though, was stand back.

"Just go with them," he heard himself say. "It will be easier. You can help. Please, Peggy, it will be okay."

And the look she gave him broke his heart all over again.

"Get off me," she said when one of the men touched her elbow. She grabbed her bag, holding it to her chest as she was herded through the door. She didn't look back.

"She doesn't need to be involved," Sam said, his heartbeat like thunder in his skull.

"So why did you involve her?" Gribble replied, talking to a child. "You gonna come nicely, Mr Hill,

or do I have to get Matt here to put you over his shoulder.”

Matt didn't look like he'd have any problem at all with doing just that. Sam flapped his arms, the words he wanted to say leaving his mouth as grunts and sighs, as broken as he was. Gribble nodded, waiting for Sam to take the lead.

“No man's an island, eh?” he said as he followed. “I heard the whole thing, Sam, and I agree. We're all in this together. You take a shit, everyone has to swim in it. Now get in the fucking car.”

Chapter 4

“Your dead man, he’s whispering.”

Sam rose from a sleep he hadn’t even realised he’d fallen into, one that felt too deep, too dark to be real. He went to sit up and found that he already was, the unexpected axis taking his breath away. The camp chair was embedded in the flesh of his back, a fist around his spine that had made his legs numb.

Pasco was a shadow in the half-open tent flap, utterly still. The light behind him wasn’t day, wasn’t night, wasn’t even dawn. Sam couldn’t remember ever seeing a light like that before. He prided himself on being able to guess what time it was if he woke, but he didn’t have a clue. This deep in the jungle, time ceased to be real. He reached for his phone but it was a brick, the battery drained.

“What?” he managed, leaning forward and feeling the world shift to accommodate him. The vertigo hit hard, like this entire tract of land had pushed itself up on ancient legs and started walking. “What dead man?”

Seb, of course. Poor old Seb. But Pasco didn’t answer him.

Sam wondered if he was still asleep, if the night had crept onto his chest and was holding his head beneath the dark. He wasn’t, of course. The jungle never let you dream. Sleep here was absolute, coffin still, as if you’d hammocked on that last thread of muslin that separated this world from the next. The darkness of it yawned beneath him, its jaw unhinged.

Pasco still didn’t move. But Sam could hear him breathing, that asthmatic rattle.

“Sebastian,” he said. “He’s talking.”

That did it, an explosion of adrenaline that lit the tent like a supernova. Sam peeled himself from the chair, his feet full of needles. His torch was where he always left it, tucked beneath the frame of his bed, and he fumbled it on to see another dead man waiting for him. Or as good as dead, anyway. Pasco looked like he’d aged by a century or more, his skin waxy, his eyes dull. He crept away and Sam followed the sound of his heavy steps. The camp had been further decimated in the night, no sign of Mo or Chris now, and Carter’s tent a puddle of wet cloth on the ground. Sam knew the last of the guides would have left. They’d shown them the way to hell and now there was nothing left for them to do.

But Pasco was still here, too old to run. He stood shivering next to Seb’s tent, hunched and broken. Sam put a hand to the oily flap but Pasco touched his wrist, leaving his fingers there.

“Listen.”

Sam did as he was told, leaning so close to the tent that his ear touched it. It felt like a corpse’s skin.

There was a corpse’s voice, too, a whisper that could almost have been the wind or the song of a distant river if it wasn’t for the shapes he heard there, the rise and fall of half-words, the cliffs of guttural stops and valleys of long, urgent vowels. The skin of his arms buckled into goosebumps, his scalp

shrinking swimming-cap tight. There was something about the sound that loosed a shard of panic right in the heart of him.

“You’ve been in?” he asked in a whisper of his own. Pasco nodded, using the back of his hand to wipe away what might have been sweat or what might have been tears.

“You hear it?” the old man asked. “Because I was hoping you wouldn’t. I was hoping this was me. The exhaustion, the madness. I wanted this to be me because that way the world isn’t broken, Sam. That way the world isn’t broken.”

It was the most Sam had ever heard the old man say. He realised Pasco’s fingers still rested on his wrist, hard enough to be painful, like they were trying to take root there. He shook him away, gently, and Pasco seemed to sink further into himself. It made Sam angry. The fear, the panic, the absurdity, it was making him angry.

“It can’t be Seb,” he said, opening the heavy flap with his free hand. The smell was like a hammer to the face, that sweet, cloying stench of death—and something else, too, something almost acidic. “He’s dead. Look, Pasco, he’s dead. He emptied himself. Mo checked him, and we all saw it. There’s no coming back from that.”

He let the torchlight go first but it did so reluctantly. The shadows of the tent seemed to grow over the beam, sinews of darkness that writhed and twisted with every move of his hand. Seb was a lump on the cot bed, just meat. There was no movement there at all, his chest and his stomach perfectly still.

But he was whispering. There was no doubt about it. Unbroken, unending, the slightest hint of a rhythm there, a song. And Sam realised that’s why he felt so afraid, because even if Seb had been alive there was no way he could get the air in to speak like this. Nobody could. These were words without breath behind them.

“It’s a... it’s a radio, Pasco,” he said. “It has to be. A stereo, a phone.”

Pasco was groaning, a noise so deep in his throat that it could have been a cat’s growl. Sam didn’t look at him. He didn’t want to take his eyes off the man on the cot bed in case he suddenly rose like a puppet, jerking his way across the tent, reaching.

“Get Ramona,” Sam said. Then he remembered that their tent had gone. “She’s here?”

“She left,” Pasco said. “Her and Chris. They’ve all gone, other than Thirty, but he’s passed out drunk. Nobody wanted to stay, not after yesterday, not with... not with that thing.”

Not a man anymore. A thing. A thing that whispered, a thing that sang.

An impossible thing. And Sam fought to tell himself this, because he’d grown up believing in impossible things only to discover again and again that there was no room in this world for them. There wasn’t enough imagination in this world for them. Impossible was a myth, there was only what was real.

This wasn’t an impossible thing.

The thought gave him courage enough for a single step. He slipped into the tent, the flap too heavy

for him, slapping him on the back as it felt like it meant to offer him congratulations. It was just him and Seb, him and his old friend, the old dog who'd been with him since the start, who'd never said a bad word to anyone, who'd never shown a hint of violence until yesterday afternoon when he'd carved himself hollow with his own machete.

He almost said hello, but he didn't want whatever was whispering to hear him.

It's not an impossible thing, he thought. It's a radio, it's a phone, it's his Walkman.

And he moved the torch up the ridge of the man's broken stomach, past those lunar ribs, to the cavern of his mouth.

Something moved, retreating into the darkness behind Seb's yellow teeth.

Fuck! Sam tried to say, but the word literally jammed in his throat, lodged there like a piece of food. He fell back into the cold embrace of the tent flap like he'd been gut punched, like he was about to be sick. He would have put a hand to his mouth except he needed both of them to hold the sudden, inexplicable weight of the torch.

The whispers started again, although Sam hadn't even been conscious of them fading. They were coming from Seb's mouth. They were coming from his mouth. He knew it without a shadow of a doubt. And there were words there but they also weren't words, as if he was listening to a brand new language butchered from the scraps of a dozen others. He lifted the torch like he was lifting a shield, his arm trembling. Seb's mouth was an open tomb, cemented by death. He'd almost bitten his tongue clean off yesterday, and what was left hooked obscenely over his bottom teeth.

Nothing moved, and yet he still spoke.

Reality peeled itself away from Sam. He could almost hear it, like tearing strips of cotton. Seb's dead, he thought. But he's trapped there. It's his ghost I'm hearing, snagged on those broken bones. And he had to smudge away the tears, because here he was, finally face to face with his impossible thing, and it had broken him.

He cleared his throat, summoned a word from deep inside him.

"Seb?"

The whispers dipped as if to accommodate his voice, rising again almost immediately. He took a step towards the table, the light swaying from side to side, bringing the entire tent to life—all of it, apart from the dead man and his ghost.

"Seb? It's me, Sam."

The whispers seemed to lose their hard edges, seemed to soften into quiet running waters. Something serpentine, something hissed, like a lit fuse.

Something dangerous.

Because it was almost as if it was trying to say his name.

It, he thought. Not Seb, then.

He tried another step, the ground eggshell thin, ready to give way at any moment and plunge him into madness. Wasn't that what Peggy had told him, all those weeks ago? There's nothing out there but madness.

And here it was, his madness.

The torch wavered, uncertain, finding Seb's eyes. Both were filled with blood and empty of anything else. He stared—

Sam flinched, aware of something before he even consciously understood it.

Movement, right there inside Seb's throat. He couldn't make sense of it, but he couldn't deny it either. There was something storm-like about it, distant flashes of quiet lightning—no thunder, just those same susurrations.

It's his ghost, Sam thought. It's right there, I'm looking at his untethered soul.

And his first thought was to unhook it like a moth in a web, to send it on its way.

"Ssssss..." said Seb, the storm rolling with the sound, vibrating with it.

Calling.

Sam moved closer, feeling like he was underwater, feeling like he was drowning.

He's calling me.

"Sssssaaaaa..."

Closer to the impossible thing inside Seb's mouth. Not a storm but something wetter, something that pulsed gently, that quivered with every bastard effort to say his name.

"Sssssaaaaaaa..."

He was at the foot of the cot now, the smell of his dead friend overpowering. He had to hold the torch over his shoulder to angle the light down inside Seb's mouth, his deltoid burning with the effort. Another step, and this time his foot hit something and sent it rolling away—the unexpectedness of it almost shattering him like tapped glass. He looked to see a roll of toilet paper, then snapped his head up again to see Seb finally take a breath.

The old man's chest rose, the movement turning his butchered diaphragm into a church organ—the sucking sound of it the very worst thing Sam had ever heard. His entire upper half was swelling, bloating like it had rested at the bottom of a canal for a hundred days. The stitches of his shirt were bursting beneath his arms, the skin there too, the air poisonous with the stench of it.

Sam put the back of his hand to his nose, drunk on it, delirious with it, and he would have turned and run for the door if Seb's haunted mouth hadn't finally closed around the back end of his name.

"Saaaaammmmm."

The coils of darkness inside his throat ballooned past his teeth, a frothing bladder whose whispers boomed like a breaking wave then broke like a gunshot.

Seb's face exploded softly, his features folding outwards like petals around the stamen of his open,

grasping throat. Everything above him seemed to have been erased, and it was only when Sam shifted his torch that he saw the cloud that hung there, as light as air, as dark as night.

It wasn't a ghost, he realised, stumbling back, another word staked into his heart by a hammerstroke of adrenaline.

Spores.

"Fuck," he said, backing off, tripping, managing to say upright through sheer force of will. The whispers had stopped, the movement had stopped. All that remained was that gentle shadow gradually dispersing.

Sam turned, fumbling for the tent flap.

"Get back," he said. "Pasco, get out of here."

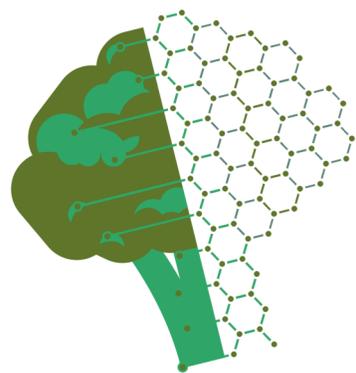
Pushing into the night, falling into the dark, reaching for Pasco to find that the man had already gone.



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