CONSILIENCE

Field Notes Volume 2: 2024



Family Trees

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Field Notes
Volume 2

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To those who grow towards the sun,
nurture others, forge connections,
and delight in the rain.



"they have carried me in their branches"
'Trees' by W.S. Merwin

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Where possible hyperlinks to related external content are also inlcuded.

Editorial

Dear Readers,

We are very pleased to present the Consilience staff anthology, Field Notes 2024, on the theme of 'Family Trees'. It has been a labour of love for the production team over the course of this year, and we are proud to share with you the poetry and SciArt that has emerged.

One basic definition of 'family tree' is 'a drawing that shows the relationships between the different members of a family, especially over a long period of time.' (Cambridge Dictionary) In his essay on 'Tree Theory, Biogeography and Branching' (The Language of Trees, 2023), Brian J. Enquist considers the structures of trees and how though their diverse shapes can appear so different, they 'can [also] be generated by very simple and common rules across all plants.... [perhaps]...all of life, including animals.'

Each poem in this anthology is, in this way, a tree. Thoughts branch out in patterns as the significance of each subject is reflected upon. The first pieces consider the structures of genetic material that influence and develop life. The poems go on to explore the idea of family and the structures it takes on. Where are the social support systems and where are the splintering branches of the broken family?

You will find personal legacies, the grandfather chemist, the distant artist uncle, the scientist proving how cholera is spread, then his descendants battling with the Covid-19 pandemic. You will also find a strange sea anemone that shares the animal tree of life with humans and a handmade musical instrument with bone tuning pegs.

What emerges is a desire for connection, to other humans, to our world and to what lies beyond, the stars and the cosmos, which can sometimes feel more like family: 'trees dotted in the heavens / forming an uncertain lineage'. (Bhargava) These connections are forged through language, music, through weavings in the soil. But the poets also grapple with our legacies of violence, that lingering dark of harm and abuse, to each other as well as to the natural world: climate change, Anthropocene extinction, deforestation, or ecological destruction.

While we must often use our divisions and classifications to study and understand the world, we also recognise the overlap, the intertwining. Where one thing ends, does another begin exactly there? There is a feeling of fate, of a structure fulfilling itself through a natural pattern but also a sense that what has come about may just as well have not. Those branches which created all our tenuous, fragile lives, the result of so many mysterious lineages, could just as easily have failed to become, and yet, 'in the soil / some hope.' (Eberenz)

Arboreal science research continues to reveal the unexpected: how trees communicate and cooperate via mycorrhizal fungus in the soil, how diversity is imperative to survival and health within a forest, their murmuring at night during slowed respiration, the brain-like structures at their root tip. Tree rings that reveal precisely when the plants were exposed to pollutants. This body of work uses these

concepts and more to unveil the ways we are connected, and not all that different to trees, anemones, mycelium in the soil: 'the tapestry / of our being.' (Illingworth)

A scientist can be a poet; a person can also be like a tree. A tree's root tip connects to another's, and a whisper travels through. And if we can continue to recognise where we interconnect, through science AND through poetry, with the whole of the natural world, perhaps we can change our legacy, 'become the branch of mercy.' (Barnes)

Miranda L. Barnes & Doryn Herbst
Guest Editors
& The Consilience Team

Consilience

Field Notes

Volume 2

Family Trees

Twists of Fate

Ancient hairpin loops
weave secrets
in the dark,
emerging
from the depths
of primal matter
to gracefully unfold
into existence.
Each composed switch
a different path
for change.
Tiny phosphate architects
weaved within us –
moulding,
shaping,
breaking,
the tapestry
of our being.
Every weft
a warp
in time
and space
and life.

Sam Illingworth

The Science

Understanding how new genes evolve, particularly in the realm of microRNAs (miRNAs), is a complex area of study. miRNAs are tiny genetic segments that play a critical role in controlling other genes. They need to form a specific looped structure to function, and even though many of these miRNA genes are ancient and well-conserved, new ones can still emerge. These new genes are particularly interesting because they can suddenly appear in specific species or groups of animals, showing how diverse life can become over time.

This poem is inspired by research that focuses on a specific way new miRNA genes can form in primates, including humans. It involves a process called 'template switching', a type of mutation during DNA replication. This process can create perfect matches for the loop structures miRNAs need, in a single step. The study discovered that over 6,000 new potential miRNA structures have been created in primates through this process, leading to at least 18 new human miRNA genes. This accounts for about 26% of all new miRNAs since primates first appeared. Interestingly, these new miRNAs often appear within other genes, allowing them to be activated and used alongside these host genes. This rapid creation of new miRNAs is significant because it provides a wealth of new genetic material for evolution and adaptation, much faster than other known gene creation methods. This means that primates, including humans, can quickly develop new genetic traits to adapt to changing environments.

Mönttinen, H.A., Frilander, M.J. and Löytynoja, A., 2023. Generation of de novo miRNAs from template switching during DNA replication. Proceedings of the National Academy of Sciences, 120(49), p.e2310752120. https://doi.org/10.1073/pnas.2310752120

Genetic Voyager

What secrets does the dark side of the genome hold?
variants interwoven in the most unknown part
and, for some, *like me*, still strange

in the beginning of being discovered
by those who dare –
Molecular explorers in ancient territories of non-coding
codices and hieroglyphs
kept in well-preserved regulatory ghost towns,
often lurking and unseen

emerging sources of variation,
an extensive mission to crack the code
of ultra-rare and conserved sequences

that world that awaits below,
roots of autosomal dominance trees
generational disease patterns
that still remain without a full picture

the answer will be revealed when decoded pieces
that have always been there
are seen

Itzia Ferrer

The Science

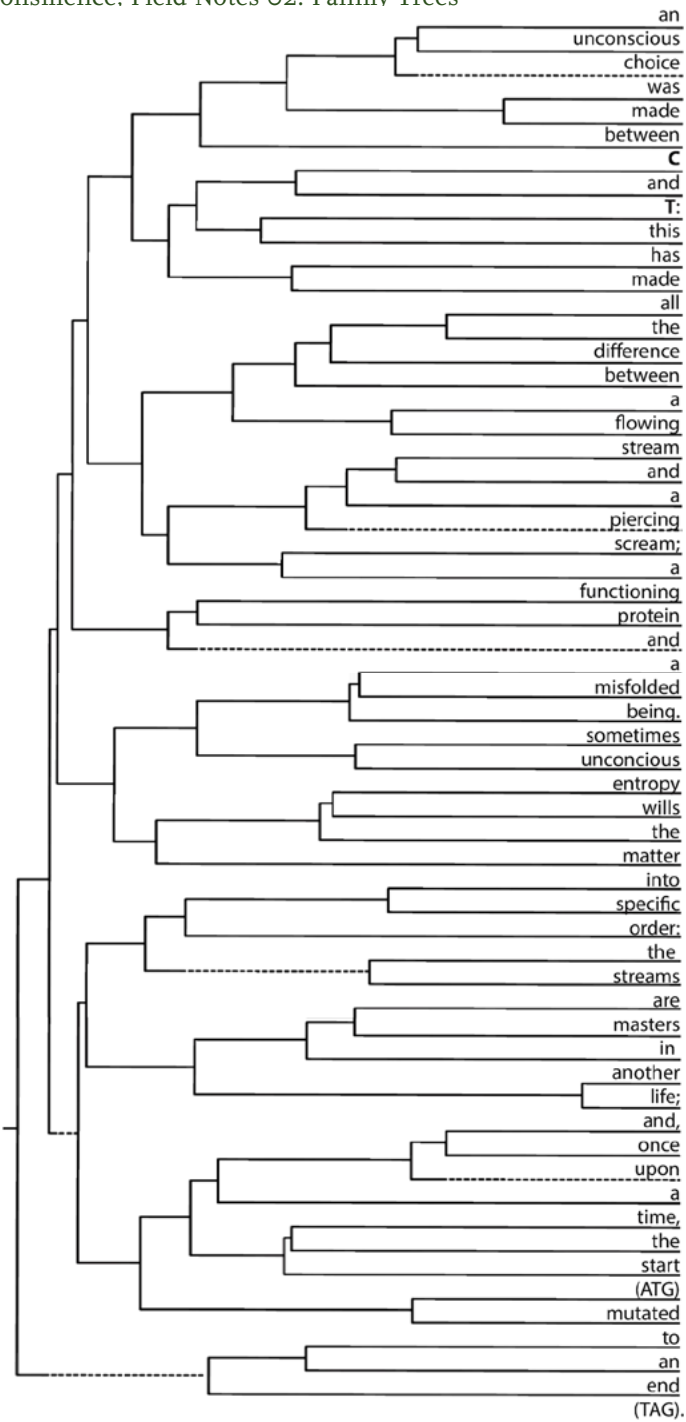
This poem was inspired by recent research that has discovered ultraconserved non-coding elements (UCNEs) that play an important role in explaining rare eye diseases. These UCNEs are genetic elements that control the development of tissues and cells, and scientists have identified a set of UCNEs called candidate cis-regulatory elements (cCREs) that regulate the development of the retina. Researchers have studied genomic data from people with rare eye diseases and found that these UCNEs are associated with 29 disease genes. In a family with a history of eye disease, a rare variation within one of these UCNEs was identified in four individuals who did not have a genetic diagnosis to explain the cause; the variation found in the family is a base conserved for at least 360 million years.

Further analysis of the genomic data revealed other variations that are associated with rare abnormalities. This study provides an explanation of how UCNEs act as cCREs during retinal development and how they can be affected by non-coding variations that cause rare eye diseases. This study suggests that non-coding regions may hold important regulatory information for different diseases.

Multi-omics analysis in human retina uncovers ultraconserved cis-regulatory elements at rare eye disease loci | Nature Communications

Free will from the perspective of a protein

Shaylee Kieffer



The Science

The phylogeny here is the evolution of the type of protein that my PhD focuses on, a CCCH-type zinc finger called ZC3H14. This phylogeny is adapted from the evolutionary analysis of CCCH proteins (Leung et al., 2009).

CCCH-type zinc fingers are composed of three cysteines (C) and one histidine (H) which conjugate a zinc ion. The sharp turns resulting from this coordination make protein 'fingers' which are efficient at binding other proteins, DNA, or RNA targets. These proteins are in all mammalian cells, meaning that every person reading this has a functioning version of these proteins in their cells.

Great thought went into the choice of which amino acid letters to "mutate" for this poem. For example, if a C (cysteine) mutated to a T (tyrosine), a zinc-finger protein would no longer be able to bind to the zinc ion, therefore resulting in a misfolded protein that cannot bind to its target interactors. This leads to ailments such as cancers and neurodegenerative diseases.

However, if we're coming from a DNA perspective, the C and T could represent nucleic acids. In this case, C stands for cytosine and T for thymine; there are only four nucleic acids, with the other two being G (guanine) and A (adenine). When the DNA code is transcribed into RNA, it is then translated into protein in sets of three nucleic acids called codons. The "start codon" is ATG, and one of the "end codons" is TAG. These are the same nucleic acids, just in a different order. So, playing with the idea of evolution and order, a protein's starting sequence could easily get mutated into a stop codon.

The point is made in the poem that the order of things matters. This is illustrated by showing the change of one letter, C->T, in a word, which changes the word from 'scream' to 'stream.' Similarly to how important that distinction is to English, the order and specific sequence of DNA/RNA/Protein primary sequence can have similarly devastating consequences to the usage of the word or protein.

You can start to understand how small mutations can lead to big 'mistranslations.'

Leung, S. W., Apponi, L. H., Cornejo, O. E., Kitchen, C. M., Valentini, S. R., Pavlath, G. K., Dunham, C. M., & Corbett, A. H. (2009). Splice variants of the human ZC3H14 gene generate multiple isoforms of a zinc finger polyadenosine RNA binding protein. Gene, 439(1–2), 71–78. https://doi.org/10.1016/j.gene.2009.02.022

Sequestered family

Love seeps below the surface—breathed in, exuded out, traded for more.
It moves through the nervous system, reading pages of biologic folklore
tracing a saga from stranger skies through an ionic core
finally settling in asphodel meadows to be enjoyed by an excretivore.

Above and within powdered humus emotions exchange
and into resonance by mineral attraction arrange,
held cherished until aether draws it from this mélange.

Until then, life turns to gold and drips microbial muditā through lithe fingers,
attracting mycorrhizae like fly amanita that tremble with connection.
Any barren field can come to terra preta; saturated, sweet, and

inwrought with heartstring hyphae resistant against
root rot: a family once sown, for now or forever

sequestered among stone dust.

Mandy Abel-Zurstadt

The Science

Carbon is the basis of life on Earth and therefore also of love.

Trees, like all other plants, connect the atmosphere with the pedosphere through the biologic processes of photosynthesis, cellular respiration, and root exodus which cycle carbon through the spheres. Carbon is sequestered when it is assimilated by plants into their tissues and used to create photosynthates, some of which are passed through the roots into the surrounding soil. Root exodus is a mutualistic symbiosis between plants and rhizospheric (soil) microbes.

I believe that human social support systems—namely, chosen family—share similarities with those that plants form interspecifically. Throughout our lives, people come and go, like carbon during photosynthesis and respiration. Also like carbon, some move deeper into our hearts and others stay on the fringes as acquaintances. Excretivore is a word I constructed for this poem to describe a microbe that sustains itself off carbon exudates from plant roots in a similar way to how we sustain ourselves off soulful connections. Asphodel meadows in this context refers to the soil itself—the mythological name may mean 'fertile' or 'flowery' when considering the Ancient Greek root asphodelòs but 'ashes' if related to spodós. What is soil if not at least figuratively fields of ash?

The scientific papers that inspired this poem:
"Regulation and function of root exudates" by Badri & Vivanco, 2009
"Root Exudation of Primary Metabolites: Mechanisms and Their Roles in Plant Responses to Environmental Stimuli" by Canarini, Kaiser, Merchant, Richter, & Wanek, 2019



Light signals

Nicholas Kinar

The Science

Light Signals for a Warming World Climate change is a scientific fact. Over the centuries since the Industrial Revolution, humanity has modified the climate of the Earth due to the emission of fossil fuels and the generation of electricity by methods that have irrevocably changed people and landscapes. These technologies are a part of the conceptual human family tree of ingenuity that also includes Morse code and Light Emitting Diodes (LEDs). Despite the provenance of technology and the personal beliefs associated with inventors, humanity must sensibly apply innovations of the past and the present to ensure survival in a rapidly changing and warming world.

Streuobst

Worms, worries
in the fruits
the memories
and in the soil
some hope

Zwiebelapfel, Bohnapfel, wir
ernten Kindheitserinnerung
statt Zertifikate, alte Sorten
von *Malus Domestica* in
Form liebevoller Schnitze, nur

den wurmstichigen *bio-carbon*
sammeln, pressen wir zu trübem -
Saft ist dicker als Wasser, doch
wir Jüngeren leben verstreut, erben

den ungedüngten Hang, den «Buck»
überdauernden Träger von
Familenbäumen, Zeitzeuge
verlor'ner Geschichten toter

Generationen, genetisch
verwoben mit windschiefen Bäumen.
Wie alt können die jungen noch werden?

Sommer werden heißer, zu trocken.
Noch tragen sie nicht und
stur setzen wir winters die Schere an
zum Erziehungsschnitt.
Was gilt noch?

Was erhoffen wir von unserer
Small-scale agroforestry?
(Die wir nicht so nennen)

Wir lesen, sie rückt als Kohlenstoffsenke
«Soil Carbon Sequestration»
suddenly, in the interest of science
and the EU's Carbon Farming Initiative

Kursive Worte rühren nichts in uns
bleiben geschmacklos, kein Anknüpfen an
Die Verknotungen von Verlustangst
und Zugehörigkeit.

Die Treibhausgasbilanz
kennen wir nicht, nicht
die Dauerhaftigkeit, ahnen aber
Kein Atom bliebt ewig gebunden

Nur in der Summe sind sie
wenn auch irrelevant
Teil eines imaginierten Planes
A beacon of hope

Uns bleibt die Geborgenheit
der Apfelschnitze
und die Bäume als
Verwurzelung für gemeinsam
verbrachte Tage, die uns über alle
Sinne, Handgriffe und Rituale
verwandt halten.
Affirming our kinship -
To whom it may concern

translation:
Juice is thicker than water

Worms, worries
in the fruits
the memories
and in the soil
some hope

Onion-apple, bean-apple we
harvest childhood memories
instead of certificates, old
varieties of *Malus Domestica*
caringly cut into wedges. Only

The wormy *organic carbon*
we collect, squeeze into cloudy -
juice is thicker than water, yet
us younger ones live scattered, inherit

An unfertilised slope named the Hump
enduring bearer of family trees
contemporary witness of
the histories of loss of dead

Generations, genetically
interwoven, crooked trees
How old will the young ones become?

Summers getting hotter, too dry
The young trees are not bearing yet
and we stubbornly apply the shears
for shape pruning in winter
What does still apply?

What do we hope for from our
Small-scale agroforestry?
(we don't call it that)

We read it's praised a carbon sink
«Soil Carbon Sequestration»
suddenly, in the interest of science
And the EU's Carbon Farming Initiative

The italic words stir nothing in us
remain tasteless, unentangled with
the knots of fear of loss
and belonging

We do not know the Hump's
greenhouse gas balance nor
its permanence, but suspect
no atom remains bound forever

Only in sum they are
even if insignificant
part of an imagined plan
A beacon of hope

We are left with the comfort
Offered by apple wedges
and with the trees
Anchoring roots for days spent
Together, transcending all senses
Movements and rituals
That keep us related
Affirming our kinship -
To whom it may concern

Sam Eberenz

The Science

Small-scale agroforestry systems such as meadow orchards (German: Streuobstwiesen) have been part of traditional (small-hold) agriculture in many world regions, including Southern Germany. While on the decline, under pressure from commercialization and industrialization of agricultural systems, agroforestry has gained renewed interest by researchers and public administration as a potential carbon sink, contributing to climate change mitigation targets, among other things. At the same time, trees and soils themselves are increasingly threatened by the impacts of global heating.

The poem juxtaposes the scientific and administrative language of carbon accounting (in English) with reflections (in German) on my family's relationship to a small inherited meadow orchard in South-West Germany. My ancestors' experience of repeatedly losing most securities except for their land during the first half of the 20th century is still inscribed in their descendants' relationship to the inherited patches of land. This transgenerational fear of loss is woven into the poem, updated with a good amount of nostalgia, both regarding family traditions and anticipative of uncertainties and loss in the wake of the climate crisis. Based on their research and experiences from engaging with local farmers, the researcher Esteban Montero contributed ideas and scientific insights to this poem.

united in liquid love

step into water
my skin absorbs liquid love
women of my past

holding on to Oma's shoulders
she drags me through the deep water
her bathing cap with plastic flowers
tickles my nose
until we reach the other side of the pool
she is strong

holding on to Mama's legs
she drags me through the shallow water
the salt water
tickles my nose
until we reach the beach
she is strong

holding on to my breath
I swim across the cold lake
the wintry water
tickles me all over
until my skin absorbs their love
I am strong

waves of us come and go
leave memories
imprinted on the sand

Mirjam Mahler

The Science

I believe that our family tree is populated by life-long swimmers because we were nurtured to become swimmers and we share personality traits that match well with a life of swimming.

Although there is no such thing as a swimmer's gene and we can't inherit the skill, there are genes for athleticism that influence coordination and power, but I doubt that these play an important role in our predilection for this sport. We are tall and broad shouldered with muscular arms and legs and these physical traits might have given us a tiny competitive advantage in the water.

Swimming was an important part of the family activities and we also had no other talent that would distract our focus, our natural talent met a natural environment.

Finding solace in repetitive movement in water with no distractions and only our thoughts for company is a predilection we all share. We also share a personality that thrives on habit, likes to adhere to routines and plans, shows strong willpower and perseverance and is unafraid of being uncomfortable.

I think of our family tree growing next to a beautiful lake we all swim in together, with its branches kindly holding our towels.

Sea anemone

I
being
many being
one divine amalgamation

we
perfect
peeled grapelets
of phylogenetic fusion

pink-
tipped fruit
loops green with sun
sugar glistening flower lungs

an
algal
animalist
of pre-Cambrian elegance.

I
skin-spit
nematocysts
stinging self-less from self(ish)ness

in
complete
fission we shape
an immaculate lemniscate

curve
doubling
particle selves
counter to quantum conjecture

we
being
irrational
infinitely divisible
rimming a silent sliding sea.

Marjorie Wonham

The Science

Humans and sea anemones are members of the same animal tree of life, but our family trees are differently structured. Human family trees show offspring descended from parents, but an anemone's family tree would be a mesh of asexually dividing parents that produced their own genetically identical twin-sibling offspring: is an anemone an I or a we? Anthopleura elegantissima is a common intertidal anemone in the Northeast Pacific. Its body is green from its photosynthetic symbionts, and when it tucks in its pink-tipped tentacles at low tide it looks like a shiny green donut.

Colonies defend their territories by stinging less-related neighbours with their nematocysts. A colony arises from a founding individual that divides and grows in a pattern mimicked by the syllable count in each stanza. A dividing anemone pinches in the middle, creating a figure-eight shape or infinity symbol. It is a quantum conjecture that a particle cannot be infinitely divided, but from the perspective of a tongue-in-cheek anemone, infinite divisibility has been a way of life since the pre-Cambrian. An individual's family tree could span hundreds of millions of years of parent-sibling divisions.

The John Snow family tree

John Snow in 1854
revealed that cholera
is transmitted via
poo-infested water; but
soon this was ignored
people left to drink
poo water as before

Less than two centuries passed
you would have thought we had progressed -alas
a similar thing is happening now...thus:
Snow's great-grandchildren by science
came together to declare
that Covid-19 is transmitted through the air

That it's still here,
suspended like smoke,
4 years on and counting.
It can still kill and maim
even healthy, fresh youth
even if it feels mild and faint
– it could be you
and you and you.
It's not just a cold or just the flu.

That only vaccination won't cut it
That we still have a lot to do about it
Such as wearing well-fitted respirators
Especially indoors,
opening doors and windows
use air purifiers,
testing and
treatment with antivirals

Join the John Snow family tree
you just need to
show support and reliance
on valid
Cholera
/Covid
/[insert future pathogen] science.
You need to be prepared to
be honest with yourself
and those around you.

Aspasia Eleni Paltoglou

The Science

The poem was inspired by the John Snow Project, which was inspired by John Snow. John Snow was the scientist who, less than two centuries ago, revealed that cholera was transmitted through contamination of water with faecal matter. His warnings were ignored, which led to many more people dying prematurely from Cholera.

In a similar manner, several scientists today (including those of the John Snow Project) emphasize that Covid19 is predominantly airborne, but again this advice has been largely ignored by many; the importance of handwashing tends to be emphasized, while in fact wearing well-fitted FFP3 respirators and cleaning indoor air through ventilation and air purifying is much more important. The result is that many more people die prematurely due to Covid19.

The parallels between the two stories made me think of all these scientists as being part of a family tree of sorts, in terms of their ethos and their struggles. In the John Snow project, scientists and medics (along with a lawyer and a writer) volunteer their time, effort and passion to create an online resource and campaign, where they give up-to-date and reliable information about the Covid19 pandemic; they try to alert everyone that Covid-19 pandemic is not over, that we still need to take precautions, otherwise many more people could die prematurely or become disabled. I am impressed by how effectively they can communicate complex science in an accessible and passionate way, as well as give us practical advice on how to reduce the risk of being infected with Covid19. I am not an expert in the area, but their advice seems sensible to me; it also helps that they back up their arguments with relevant scholarly literature. Their ethos of honesty and evidence-based public health inspires me, and I wanted to celebrate them with a poem.

before it was dead, bone was alive

as i tune, i wonder what the bones of my mandolin
remember
my fingers fit perfectly into
the soft scoop of the bone tuning pegs
and a jolt of a memory that does not belong to me
tells me that even after death
bones are soft
are kind
are resonant
are absorbing and building
listening and sighing

why do you think the ancients chose them
for the first instruments?
lives become memories become music
we sing thanks to those who came before us

who did these bones belong to before
they were fashioned into tuning pegs, before
my fingers touched them, before
my grammy as a child, before
her mother as a child, before
her father used them to tune up and sang so clearly
into the sky above the holler?

when she was a girl
they gathered on the front porch
swapped story songs
at the end of a long day
now, at the end of a long life
we gather in the living room
four living generations
and many more dead
to swap songs and tunes and memories
to pass them between us
like calcium between blood and bone
to lay down rich rings of ancestral mineral

from her bed, my great grandmother smiles
her hands tap the beat of her father's songs
at my ankles, the ghost of some small critter
called by the bones
settles in to listen

Kate Giffin

The Science

This poem was inspired by the bone tuning pegs on my ~90-year-old mandolin, which was passed down to me from my great-great-grandfather. He played traditional music in the Appalachian Mountains of Virginia, including ballads that can be traced back hundreds of years. While I don't know the source of the bone on my instrument, it is part of a long history. Since prehistory, bone has been used for musical instruments due to its durability, musical properties, and cultural significance.



Bone is a living organ that is constantly being remodeled. The minerals that make up the bone matrix are broken down and resorbed into the blood, making them available for other uses in the body. This allows new bone to grow and repair from injuries and the stress of everyday life. In a similar way, our traditions, families, and ourselves are constantly being remodeled. When I play my mandolin, I often feel like I am in conversation with my family, my musical community, and all the other living creatures that have made this instrument.

Resources:

Wikipedia. "Child Ballads." Accessed 2024.

Owen, James. National Geographic online. "Bone Flute Is Oldest Instrument, Study Says." Accessed 2024.

Davis, Josh. Natural History Museum (nhm.ac.uk) "Some Bronze Age Britons turned the bones of dead relatives into musical instruments." Accessed 2024

Photo: Kate Giffen



The Crow in Bat Country

débora Ewing

The Science

Pareidolia is the tendency to perceive a meaningful image in a random pattern - like ink blot tests, or seeing faces on things. The inspiration for this art (and several other planned pieces) comes from coffee grounds in the bottom of a certain mug. The art is executed on scratchboard: a layer of India ink is spread over a layer of white kaolin clay. The artist has to remove the ink to reveal the image, like carving.

AI Generations

For John Atkinson Grimshaw (1836 – 1893),
a painter and distant uncle

Create a moonlit urban scene in the style
of Atkinson Grimshaw. I climb into the screen.
The docks of Liverpool stretch for sooty miles
in opium dreams of fog and cobbled paths.
Above me, disembodied gaslights gleam
as horse-drawn carts and watchmen wander past;
I learn it's best to not count legs. But why
does the River Mersey flow past Hampstead Hill?
Why is the dome of St Paul's on a mill?
Perhaps it's a critique of power and class –
a secret message in my uncle's art?
Beneath his Trysting Tree I ponder the sky
through branches topped by square-rigged masts.
I touch the garbled signature etched in the bark.

Laura Webb

The Science

Artificial Intelligence (AI) image generators are trained on datasets of pictures tagged with descriptive keywords, to learn how to reproduce their "feel". Problems arise when datasets are small, when elements look superficially similar (e.g. the moon and a gas lamp), or when elements are unique (e.g. Liverpool's River Mersey and London's Hampstead Hill). Amusingly, AI lacks the context to understand that a horse has exactly four legs, since only three are visible in many still images, or two horses may overlap.

Whilst the accuracy of AI-generated images is improving rapidly, ethical issues will be trickier to resolve. Training datasets use millions of copyrighted pictures without compensating or seeking the consent of artists. I often wonder what my distant uncle would think of his work being monetised in this way.

Grandpa was a Chemist

An inventor too I wonder now at my gleaming bench
whether he would be proud how I've learned to

pour
my
self
care
fully
down
the
back
of a spoon

not spilling a single drop of womanhood wasting usefulness
cascading from my head filling fathomless cups held expectant

The way grandma, poised at her piano, filled chords with tears
released precisely between slices of onions and unopened dreams

scattered with rice and memories skipping along forgotten
tile floors of the Great Wall of China standing resolute beside

painted ANZAC soldiers — holding the world together — a stitch in time

Amino acids and amines curing the sky clearing
the scourge of burning desires so we can all breathe easily

compounded by hands grasping at unfounded notes

in-har-mon-ious

hidden intervals staved beneath dust motes embroidered
into every bipolar molecule mind washed down the line...

Grandpa was a chemist and an inventor too
but he invented a woman without solutions

Leslie Almberg

The Science

My grandpa was a chemist, an inventor, and an early pioneer in computers and environmentalism. He patented some of the first smokestack filtration systems to reduce industrial air pollution and engendered a deep sense of ecological responsibility in me from an early age. My grandma, on the other hand, was a trained concert organist who suffered a life of untreated depression and ultimately succumbed to dementia. The clearest lessons I learned from them was how to use a spoon to transfer liquids and how to pour pain into art to avoid spillage on both fronts. A link to his book can be found here: https://doi.org/10.1080/00022470.1961.10468026

Content warning: Physical abuse, Violence

Tangles, Spirals and Cycles

"Folks who experience domestic violence have a high risk of traumatic brain injury... Each time you get a concussion, even if symptoms resolve, there's a part of your brain that isn't working as well." [1]

After the punches and broom handles and cup shards
the tau tangles coalesce, gripping each other like siblings
in a family disintegrated, one boy's hand rising to the dent
along the midline of his skull, barely palpable.
The doctors would call this a prodromal symptom;
the harm before the violent form.
The doctors prophesize in despair.
More than kinetic energy has passed between them.

So the boy would later belt his own son,
shadowed against the kitchen light.
The one looming above is a lump of protein,
all axonal shearing and no spark,
all muscle and tauopathy.

The kicker is that it's never the first time.
The wizened have witnessed this spiral as faithfully
as the boy now tracks the stars in his own eyes.
The boy believes he's being taught a lesson;
I am telling him not to learn.

Dylan Randall Wong

The Science

Cycles of abuse are a well-documented phenomenon in science and media. Our most robust estimates suggest that nearly 30% of maltreated children go on to maltreat their own children. The mechanisms of this are multifaceted, but one I highlight in this poem is the biological mechanism.

Physically abused children sometimes suffer from traumatic brain injuries (TBIs), and people who experience TBIs are at higher risk of becoming perpetrators of violence and abuse. The misfolding of tau proteins and the consequent tau protein aggregation are oft-implicated neurobiological factors in TBI-related brain diseases. People can also experience axonal shearing, where the axons (long connective fibers between neurons that facilitate communication) are torn due to abrupt movement of the brain. Both of these abnormal processes disrupt the normal activity of the brain, leading to mental disorders that include symptoms such as aggression and violence. These neurobiological pathways of intergenerational maltreatment complicate simplistic narratives about perpetrators of abuse as the work of unadulterated evil.

Through my research and practice in clinical psychology, I have witnessed the devastating and lasting injuries - physical, mental, and spiritual - of abuse on people. Life experiences yield lessons, but the lessons of these experiences need not be learned. Many parents want to do better for their children, and we try our best to guide them in their search.

[1]DomesticShelters.org (2016, Dec 19). How Domestic Violence Can Injure the Brain. https://www.domesticshelters.org/articles/health/how-domestic-violence-can-injure-the-brain

green glass dreams

nobody had to break you but they did
they broke you into quiet parts so you wouldn't run
they told you your voice wasn't good enough
because that's the love they knew
somebody broke them too

in my dream you were green glass
jagged edges suffering and safe
it would cut to pull you through
we can stand here forever
an odd together

débora Ewing

The Science

There are two aspects of science to this piece: the first is that the first stanza came to me in a dream. This has happened enough that I'm pretty good at waking up and writing down what I remember. The second stanza I wrote while awake, describing the image that was still very clear in my mind.

The second scientific aspect is that of generational trauma, and whether survivors of childhood abuse will become abusers themselves. Study is ongoing, but consensus so far is that generational trauma is real, but abused children often do not grow up to become abusers.

Resources:

Nir, Y., & Tononi, G. (2010). Dreaming and the brain: from phenomenology to neurophysiology. Trends in Cognitive Sciences, 14(2), 88–100. https://doi.org/10.1016/j.tics.2009.12.001

Yehuda, R., & Lehrner, A. (2018). Intergenerational transmission of trauma effects: putative role of epigenetic mechanisms. World Psychiatry, 17(3), 243–257. https://doi.org/10.1002/wps.20568

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Diluting family trees

part 1 – Breaking up

So, we finally let go
you and I –
to be free.
The grey shades of singular
await us.

Someone put my heart
in an icebox.
(I thought it was supposed to mend).
It's funny, there's no wound,
yet somehow, I feel raw.

Perhaps my freedom
is getting over you?

part 2 – Moving on

And now it's just a question
of chlorophyll.
We got the shade we wanted, but...
How green is the grass
on the other side?

It could be an effect
of the sunlight –
does diffracted independence

seem greener than the
pigments of stability?

Perhaps emptiness
will elute it in time.

Alison Hramiak

The Science

This poem is about a break-up that split a marriage and a family. At the time I was studying plant biology, using chromatography to split chlorophyll into its constituent compounds, (eluents) such as xanthophylls and carotenoids. The colours are metaphors to describe how being single can be a grey area, how the grass is not always greener on the other side, and how when a pigment (analogous to being single) is eluted – weakened in colour – things don't always look as green as they did when being part of a family.

This is similar to the process of chlorophyll break down in autumn when leaves change from green to different shades of red, yellow, orange and finally brown as they die and wither. The poem is meant to reflect the dying of the colour as a metaphor for a family break up. Having made the break, the poem then questions whether the colour (shade) that was achieved by it, was actually what both parties wanted, with the hope in the final lines that moving on will soften the blow by extracting (diluting) the strong green over time.



Opportunity

Erin Kavanagh

Opportunity

Premise:
There is no such thing
as a family of trees
– only a habit.

Ontology:
All trees are plants but
not all plants are trees – do not
be fooled by a name.

Methodology:
A forest is a
gathering of privilege
– a social network

(note: do not confuse
convergent evolution
with notions of kin).

Epistemology:
A tree is no more
than a well-lit expression
of plant genetics,

almost any plant
can grow up into a tree
– it's a lifestyle thing

(wood is also not
a formal phyletical
category ...).

Outcome:
A trunk-centred, tall,
herb that branches and lives long
is 'being a tree',

even a little
dandelion can seize that
opportunity.

Conclusion:
Becoming tree-like
can be temporary
– take nothing for granted.

Summary:
A plant's solution
to the problem of light is
to become a tree.

Erin Kavanagh

The Science

There is no such thing as a tree gene, yet we can probably all claim to recognise a tree, even if we don't know its name: a plant that is perennial, tall, with a substantial trunk and root system. However, this also describes many herbaceous plants that we would otherwise term shrubs, herbs, or even weeds. If they were to strive for more light, have sufficient water and nutrients to rise above their neighbours, trunks strengthening to cope with the height increase, they, too, might become trees. Phylogenetically, the difference is simply one of habit - grown from opportunity. more..

Coincidence?

you wake up at 5am, crying
3am my time, I'm wide awake
a dream about life
loss, real and imagined
images coexisting, by chance
in our two brains, over
1,000 miles apart – it's weird

i'm a scientist
coincidence, consonance, correlation
i know it all, but sometimes
i wonder about the invisible
thread of genes, scars, stories
of our mother, our father
and everyone who came before

the thread that travels
through clouds and under oceans
connecting my mind to yours
neurons firing in synchrony
so that we know that in this life
and on this planet

we are not alone

Rachel David

The Science

I wrote this poem in response to a real incident. It was obviously a coincidence; the brain is biased to identify patterns and find significance in such incidents where there is none (see https://thedecisionlab.com/biases/illusory-correlation for a more detailed explanation).

Yet, I wondered whether there was something else, some invisible connection that we share with our families which creates such experiences (or, at the least drives our interpretations of these 'coincidences'). This connection is a combination of our shared genetic traits ('nature') and the family/cultural values ('nurture'), both of which shape a huge part of who we are, our behaviour and how we perceive the world. And of course not forgetting the blurred line that is epigenetics: the environmental influences that actually change our genetics and are passed down through generations, eg trauma.

Main Sequence

Some nights I talk to the stars
instead of calling home

The stars appear closer
an invisible thread, web-thin
pinned at the neck — I am connected

A faint smudge to mark my height each year
pulled taut when I need to stand straighter
a gentle tug
to look them in the eye

I arrange my family of stars
as with any constellation
Four trees dotted in the heavens
forming an uncertain lineage

Around them more invisible lines
threading together twin brothers
a handful of wounded and fierce sisters

Perhaps they fight, too, though
I would not notice. Their stillness is strong
a rapturous punctuation. I always wanted stillness
– but selectively

Like water in cupped hands
a thumb blotted on a chalk-white moon

Not the stillness of your mouth against
a mutiny of tears
or the deranged constant of a war

A stillness that was not
the mute relative of pain
was harder to find at home

Fortunately, there were stars
whose solitude was chosen
not enforced. Each one silent
and still—
burning and burning

Sunayana Bhargava

The Science

The poem takes its title from an astronomical classification which applies to most stars in our universe. The main sequence is the most 'stable' period in the life of the star, despite the physical intensity of the processes taking place in its core. Stars, at their distance, give the impression of balance and equilibrium, in a way like families. Constellations, coincidentally, use the collective noun 'f"amily'." A family of constellations groups stars according to proximity, theme, or origin. Existing families within stars have often come from mythology, such as twins Castor and Pollux (Gemini), and the seven sisters (Pleiades).

ریاکار

از صبحی که لبان بنفشت را می بوسم تا شبی
که با آن لباس قرمز زیبا تو را در آغوش می کشم....

تنها چهار میلیاردو ۵۴۰ میلیون سال وقت دارم! و در این
میانه محو زیبایی توَ خواهم بود .... امیدوارم در اینّ مدت .کوتاه !
از جاودانگی روح سفیدتو، تصویری بگیرم، که نشان دهم
جهان ریاکارمی تواند نوید عظمتی بی ریا باشد .

Pharisee

From the morning I kissed your purple lips to the night when I held you in my arms in that beautiful red dress...

I only have four billion and 540 million years! And in between, I will be enchanted by your beauty...I hope in this short time! From the eternity of your white spirit, I will take a picture to show the universe that a pharisee can be the harbinger of unmatched greatness without a pharisee.

Mohsen Dolatabadi

The Science

Humans have always played a crucial role in Earth's ecosystems, forming a relationship that is as interconnected as family ties, a concept known in sociology as Functionalism. This deep connection is depicted in my poem using cosmic imagery. For example, the 'blue shift' metaphorically marks the beginning of human influence, while the 'red shift' suggests its eventual conclusion. Humans are both creators and destroyers of their environments, and their collective actions merge to significantly influence the planet's overall character. Although individual mistakes may be fleeting, the overall impact of human efforts has greatly enriched Earth's "white spirit", akin to how a soul's essence remains despite brief lapses.

Arboreal

I grew up in a story carved by chainsaws
great giants collapse under the teeth of greed,
polluted teardrops fall to surrendered territory.

a nightmare woke me,
ringing dusty soundtracks, metallic screams
lustrous fabrics, polluting tender roots
all that has been silenced, in the name of progress
hazily gazing at the reflection of destruction,
along the skyscraper's skin

I write a new message in the history books
it's time to tell the truth, Holocene
respond to the past with an epoch of hope
one that declares a connection to
our ancestor's verdant dreams.

Kayla-Jane Barrie

The Science

This poem is inspired by the concept of human-forest relationships (HFR), which highlights the interdependent relationship between people and forests. Personal experiences, cultural and societal backgrounds, and the environmental setting influence this relationship. HFRs are unique to everyone and consist of emotions, knowledge, practices, values, and other meanings that a person associates with the forest.

Humans constantly transform natural environments through exploitation and management. This puts pressure on old growth forests - forests that have grown for a long time without significant disturbances, containing large and old trees of long-lived species beyond traditional harvest age. They are also home to all phases of a tree's life (saplings, mature trees, dead standing, and rotting on the forest floor). By considering the ancestry and ecological roots of forests and the environment, we can learn how to create a respectful relationship with the natural world.

The Dendrochronologist Reads the Trees to Musical Accompaniment

Slices of tree trunk
are laid on a turntable

modified to read the lines,
lineage of pith and resin,

and transform them into notes.
Blue light indexes density,

reveals the song
of summer fevers,

a record for every year.
Percussive piano keys

convey the strength and
thickness, rate of growth –

where the years grew darker.
Because a tree holds a scroll

of riddles inside, I fan them out,
read for evidence of seeping

poisons: arsenic, cadmium,
lead, antimony, barium—

buried in the parallel
curves, concentric circles

of earlywood and latewood.
Rings divulge their secrets

through spectroscopy, chemical
analysis. I hear the minor keys

lament diminished inheritance:
the oracles of shrinking cambium,

inhibited photosynthesis
as we dim the sun with dreck.

Hear them sing the fates
of future change

and beseech us listen,
become the branch of mercy.

Miranda Lynn Barnes

The Science

This poem examines the legacies that can be traced within trees through the study of dendrochronology, or tree ring science. While many are aware that by counting the rings of a tree, you can determine its age, these rings can also reveal the exact timings of pollution events and data is being gathered worldwide from tree rings to track climate change. Also part of this poem is the music created from tree discs on a modified turntable by Bartholomäus Traubeck, who created a song for seven different types of tree, each using a slice from that tree's wood. Overall, what I hope is examined here successfully for the reader is not just the legacy of the trees, but the legacy of human impact, and the stories these trees are passing on to us – if we are listening.

Biographies of Poets and Artists

Mandy Abel-Zurstadt is a recent recipient of a master's degree in geological sciences. She writes poetry about Earth science both generally and as inspired by their research interest in soil to communicate the wonder of geology. She is especially interested in exploring parallels between processes of natural science and inter/personal psychology through personification of the former. You can follow them on X @mycorrhizalmaz. ***poem***

Leslie Almberg's background in volcanology propels her work as a science educator and curriculum designer for the Australian Science Olympiads. She imbues her teaching with art and her creative writing with science, snug in interstices of life's Venn diagrams. Her poetry and fiction are published in various anthologies and the temperate rainforest of the Dandenong Ranges. ***poem***

Miranda Lynn Barnes is a poet, academic, and interdisciplinary researcher with a keen interest in where poetry and science intersect. She is the author of Blue Dot Aubade (V. Press, 2020) and Formulations (Small Press/Tangent Books, 2022), a chapbook of new poetic forms based in chemistry, co-authored with Stephen Paul Wren. Her poem 'In the Pines' was awarded second place in the Verve Poetry Competition 2023. Miranda's poems are widely published in journals and anthologies, both in the UK and abroad. More at https://mirandalynnbarnes.wordpress.com/ ***poem editorial***

Kayla-Jane Barrie is a poet, abstract artist, naturalist, and science communicator. Her darkly enchanting work asks deep philosophical questions, often with a speculative twist. The power of poetry ignites her curiosity about nature and humanity. She facilitates art and

science-themed workshops from her home in Ontario, Canada. abstractexpressionsbykaylajane.com ***poem***

Sunayana Bhargava is a British-born Indian astrophysicist and poet. She is an alumna of the Barbican Young Poets programme. Her work has been featured in the Bloodaxe Books anthology Hallelujah for 50ft Women, BBC Radio 3's The Verb and Arts and Ideas series, and by the Dead Women Poets Society. ***poem***

Rachel David has a PhD in Immunology and an MSc in Science Communication, and currently works in healthcare/pharmaceutical consulting. Rachel writes poetry (published in Dear Damsels and N2), fiction (flash fiction finalist for LISP 2022) and science-focused non-fiction. You can read her exploration of the science of mind–body practices (mainly yoga) at geeky.yoga and her monthly newsletter. ***poem***

Mohsen Dolatabadi holds a master's degree, progressing from the concrete micro world of analytical chemistry to the abstract macro world of cognitive psychology. He is multilingual in Persian, English, and German and has experience consulting, teaching, and philosophical analysis. Struggling with hyperhidrosis early in life, he was motivated to overcome this invisible barrier by pursuing advanced degrees in more abstract fields better suited to his condition, becoming an enhanced thinker across micro and macro domains. He expresses his somewhat diverse knowledge and interests through poetry and lyrics in Persian and now English. ***poem***

Sam Eberenz embraces the inaccessible and the uncertain – overconfident that there is immeasurable significance in vulnerability. The genre often turns out to be climate nostalgia. Sam has published poetry in armarolla, eXperimenta and Consilience Journal and co-developed the collaborative writing tool LitApp. When Sam facilitates creative sessions, it is all about collaborative and experimental writing, trying to use the joint writing process as a tool of expression, to explore the imaginative, gain new perspectives – or simply as a source of joy by and in itself. ***poem***

débora Ewing writes songs and poems, paints, and screams at the stars because the world is still screwed up. She improves what she can with music collaboration or laying out poetry books for Igneus Press. Follow deb on X and Instagram @debsvalidation. Read her self-distractions at FolkWORKS.org and JerryJazzMusician.com. ***poem artwork***

Itzia Ferrer - a tropical coincidence thriving in the Scandinavian Forest, is a scientific communicator and a poet. Her roots are in Mexico, but for the past decade, she has called Sweden home. Her love for science, genetics, and the brain finds expression in the beauty of poetry, making current research and art more accessible and relatable. She finds solace and inspiration in nature, using poetry to express her passion for science and the wonders of everyday life. ***poem***

Kate Giffin is a poet and a PhD candidate in neuroscience at the University of Michigan, USA. She studies how severe illness (sepsis) harms the brain. She is a member of Michigan Science Writers (MiSciWriters), as a writer and editor for the MiSciWriters blog

and co-Editor-in-Chief for their science/art magazine EquilibriUM. Her poetry can be found in Shooter Literary Magazine, Glintmoon, EquilibriUM, and, most recently, the Muskegon Museum of Art as she won honorable mention in their 2024 Art Talks Back Ekphrastic Poetry Competition. ***poem***

Doryn Herbst is a former water industry scientist working in Wales, now lives in Germany. Her writing considers the natural world and themes which address social issues. Poetry in print and online, including: Amsterdam Quarterly, The Wild Word, Ink Sweat & Tears, Osmosis. She is putting together her first collection. Doryn has contributed to this volume as co-editor.

Alison Hramiak is a part time poet and teacher educator, with a plant and micro-biology background, living and working in Yorkshire. She is published in Forward Poetry anthologies, New Contexts 4, and also on various web sites such as Dirigible Balloon, Impspired and The Causley Trust. She reviews poetry and poetry anthologies, and also performs at open mic sessions. She blogs about poetry for the Sheffield Institute of Education and on Sunday Mornings at the River, as well as on her own web site www.poetryforlives.co.uk. ***poem***

Sam Illingworth is an Associate Professor at Edinburgh Napier University whose research involves using poetry to develop dialogue between scientists and non-scientists; in particular he aims to platform the voices of audiences that are traditionally under-served and under-heard. You can find out more about Sam and his work by visiting his website www.samillingworth.com. ***poem***

Erin Kavanaugh (she/her) is an interdisciplinary scholar, poet, artist and archaeologist. With a background in Geoscience and Philosophy, her research is concerned with intersections within and about the space-between - with a particular focus on the relationship between fact and fiction. This is examined through Deep Mapping, SciArt, Geomythology, and Experimental Poetry/Art as Method. Based in West Wales, her work is site-specific, multi-modal and hydro-centric. You can find out more at: www.geomythkavanagh.com ***poem artwork***

Shaylee Kieffer is a PhD candidate working on her dissertation on the effects of a zinc-finger protein in its non-canonical role in the DNA damage response. She spends most of her time running biochemical experiments, and writes poetry during her incubation periods. ***poem***

Nicholas Kinar teaches at the College of the Rockies in British Columbia, Canada. He designs electronic circuits for measurement and communication in the geosciences. Connect with him on Twitter (@KinarNicholas) or Bluesky Social (@kinarnicholas.bsky.social) where he shares a Hydrology Paper of the Day. ***artwork***

Mirjam Mahler writes poems and stories. She says her body is German, her heart is Spanish and her words are mostly English. She swims in lakes year-round, hosts writing workshops and book clubs. Her poems have been published in numerous anthologies

and journals and she published her first collection, "Cold Water Poems" in early 2024. Mirjam is co-editor of Facing Goodbye - a poetry anthology for The Wee Sparrow Poetry Press published in July of 2024 and volunteers for The Wee Sparrow Poetry Press and Consilience Journal. Instagram @mirjamwrites and mirjamwrites.com ***poem***

Aspasia Eleni Paltoglou is a Senior Lecturer in Psychology at MMU and an Associate Lecturer in public health at Oxford Brookes University. Her interests include exploring factors that influence creativity, and she is particularly interested in the interaction between creativity, education, and emotion, especially in online settings. She is a member of the World Health Network, a global community that aims to inform the public about the latest valid research and practical advice in relation to Covid19, in order to help reduce harms for individuals and society and end the Covid19 pandemic. She is passionate about science communication, and she is a Member of the Psychologist and Digest Editorial Advisory Committee for the British Psychological Society. ***poem***

Steve Smart is a poet and artist living in Angus, not far from Dundee, Scotland. As well as ecological themes, Steve is interested in memory and technology, both working and dysfunctional. Steve designed this edition of Field Notes. artsci.co.uk/sds ***artwork***

Laura Webb is a junior doctor whose poetry explores themes of illness and healing, folklore and the animal kingdom. She studied History and Philosophy of Medicine at UCL and is currently working towards an MA at London's Poetry School. When she's not writing, she enjoys dancing the Charleston and Lindy Hop, and looking for bats with a home-made detector. ***poem***

Dylan Randall Wong is a Singaporean who lives in Columbia, South Carolina, working on his PhD in Clinical-Community Psychology. His research is about making therapeutic and prevention programs work better in community contexts. His poems - often scratching the humanistic itches along his scientific body of work - can be found in SG Poems 15-16, the Anima Methodi anthology, and right here in Consilience Journal(!) ***poem***

Marjorie Wonham is a marine biologist who appreciates any poem about a marine invertebrate. She teaches field- and lab-based undergraduate marine biology courses at the University of Washington's Friday Harbor Laboratories in the Northeast Pacific, and has developed and taught interdisciplinary courses in biology and poetry. She also offers biology-poetry workshops at the Hollyhock Retreat Centre in the Gulf Islands of British Columbia. ***poem***

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