

A Contribution to the Anatomy of *Ginkgo Biloba*

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A Thesis
in the Department
of
English

Presented in Partial Fulfillment of the Requirement
for the Degree of Master of Arts (English) at
Concordia University
Montreal, Quebec, Canada

April 2013

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CONCORDIA UNIVERSITY

School of Graduate Studies

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and submitted in partial fulfillment of the requirements for the degree of

Master of Arts (English)

complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

This manuscript of poetry uses the ginkgo tree (*Ginkgo biloba*) as a thresh-hold from which to open up a discourse between the biological sciences and poetry. The ginkgo tree is an important outlier to tree taxonomy, one that complicates and provides elusive clues towards the origins of flowering plants out of gymnosperms. It is a motif in Japanese and Chinese art forms of painting, gardens and bonsai, and its extract is a popular folk remedy for poor memory and low cognitive function. The poems take on many forms (found poetry, erasure, sonnet, and cento among them) to express different cross-sections of the relationships between science, poetry, society and the arts. The poems show how scientific language can be beautiful, and conversely how it can intrude upon the lyrical. They attempt to communicate how evocative the conceptual backdrop for the biological sciences can be, and they juxtapose the lyrical to the scientific eye, arguing that these two stances are far from diametrically opposed. The figures used as organic section markers pace the thesis and signal changes between modes of writing or thinking—allowing different experiments with language to coexist in close proximity but remain in different timbres—while providing, themselves, a commentary on visual forms of scientific communication. This thesis draws techniques from poets such as Christopher Dewdney, Mari-Lou Rowley and Adam Dickinson.

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>tr|Q4FG31|Q4FG31_GINBI Ribulose-1,5-
bisphosphate carboxylase/oxygenase large
subunit (Fragment) OS=Ginkgo biloba
GN=rbcL PE=3 SV=1
MSPKTETKASVGFKAGVKDYRLTYYTPEYQTKDTDILAAF
RVTPQPGVPPEEAGAAVAASSTGTWTTVWTDGLTSLDRY
KGRCYDIEPVPGEENQFIAYVAYPLDLFEEGSVTNLFTSI
VGNVFGFKALRALRLEDLRIPPAYSKTFQGPPHGIQVERD
KLNKYGRPLLGCTIKPKLGLSAKNYGRAVYECLRGGLDFT
KDDENVNSQPFMRWRDRFLFCAEAIYKAQTETGEIKGHYL
NATAGTCEEMMKRAVFARELGVPIVMHDYLTGGFTANTSL
AHYCRDNGLLLHIHRAMHAVIDRQRNHGMHFRVLAKALRM
SGGDHIHAGTVVGKLEGEREVTLGFDLLRDDFIEKDRSR
GIYFTQDWVSMPGVLPVASGGIHVWHMPALTEIFGDDSVL
QFGGGTLGHPWGNAPGAVANRVALEACVQARNEGRDLARE
GNEVIREASKWSPELAAACEVWKEIKFEFDTVDVL

At the Edge of the Garden

This is an exercise in becoming. I am still, patience oozing slowly down through the layers of earth that wrap me. I am becoming solid. The weight of the sky becomes less, and I suck at the juices of the earth. I am a pump. I stretch out my hands, fingers stubbornly locked together. I split them apart, but not quickly enough—they are stained golden yellow with the sun and I can no longer hold them to myself: they drop.

Star Dream

If the spread of thought could slow,
thicken itself to just above the point
of crystallization, teeter on the edge

of solidity and yet still move with the
quickness of oceans. If the curl of toes
could harden into a semi-permanent

impression, cradled by earth's deep
recesses of granite.
If I could touch

a point where the world falls faster
than the speed of light and is not just left behind
in the spinning darkness, then perhaps all

of this chaos wouldn't matter any more.
Maybe we'd slide ourselves
together to form a net around

the aureoles of stars and empty space--
hand to hand and feet to feet, crabbed sideways
and upside-down with no polarity.

I am a sentence

The moment of determination,
when the multitudinous cloud of possibility
becomes a single mote

of permanence
or semi-permanence;

a tiny fermata of an idea.

She writes Ginkgo

not because its leaves tumble
gracefully under the wind
of a hundred poets' pens

not because its leaves house
a chemical balm for those
whose brains forget themselves

but because its ancient fan
is the closest link between
her evergreens and the oak,

because its phenology has
been preserved for thousands
of thousands of years:

Paleozoic leaves
fan phylogenies of trees.

Ginkgo House

All is eclipsed by the ginkgo's shadow,
blotting out my small kitchen.

Couch, desk, books and table are familiar,
tea set waiting for the rain
to fall through the open ceiling.

One tea cup cradles the precious ovule
waiting to be fertilized
by its enclosed pollen grain,
slowly turning mottled
with desire.

Drops slip on white ceramic,
rivulets running down off
the shading green fans.

I reach up along the smooth bark
that holds the roof up:
its soft breathing
imperceptible.



FIG. 35
Ginkgoales

Trichopitys heteromorpha: A short shoot in the axil
of a leaf; reflexed

We hum as a solid, singing
wall of vibration—each of us a
string plucked by the universe
flexing its arms.

Inscription on a Tree

I can't find the fading molecular
traces of my fingers along this bark.

No infinity of hieroglyphs can describe
the scent of her on the spring air.

There is only so much space
that can be taken up by pure energy.

The woods are grey again, where they were
so recently the stark black of pupils.

One breath's worth,
perhaps two, of falling.

In Abstract

She was the solid wrapped
around my chest,
the embodied emblem
of so many more patterns,
abstracted from xylem and phloem,
pulsing in their autonomy from her.

I couldn't touch any centre point,
couldn't say why I lingered
at the edge.

First Date

Her roots tickle the deep loam of her feasting pot, while I grind pepper, cut my steaks and take a sip of my uncomfortably oaky red wine. The waiter brings her another carafe of water, and an *amuse bouche* of powdered limestone. Conversation is sparse.

Second Date

I reach over tentatively during the first suspense scene, hero tip-toeing through the unlit hallway of an old hospital, but she plays it cool. I run a hand along the smoothed places on her neck, but she is stalk still, facing the screen. The couple in front of us snuggles closer. I rub a finger slowly around the knot on her arm.

First Fight

I want to be told where we're going, and she won't answer. Her phone is always turned off, but there's nothing I can say to soften the resistance in the way she holds her spine so stiffly against my caress. She won't say it, but I know what she's thinking. I know that the conversation isn't over, that she'll meet my eyes defiantly again and again, waiting for me to break the silence. That she'll refuse again and again to soften under my hands, her limbs quivering under my fingers, leaves rustling.

Third Date

I want to go for a walk in the park, but her trunk is too stiff and so we sit on a bench watching other couples walk in the park. We soak up the sun, watching the ducks float then dive, float then dive for no reason we can see. I can feel her attention shift to the big old oak on the island, its arms braced strongly and somehow also gracefully against the direction of the prevailing wind. What do I think I'm doing?

Another Fight

We've been over this ground, swept our combined weight at each other in mime and lifted the scent off each other so many times that I can't control the flow of chemical energy from one end of my metabolism to the other, can't slow cellular respiration. My temper flickers like the sparks of adenosine triphosphate, glimmering in and out of phase: I, magpie of magpies, am a vast array of chemical causations.

Maybe the idea of

the chemical structures
in flux in each of your cells,
the inexorable circulation of water,
nutrients used and reused and
everything cycling
through you.

your arms reaching up
with your
forgetful fingers,
caressing the empty air,
combing it for ancient traces.

the roughness
of your skin, its deep brown
impenetrability, your
gentle sway.

Fortune Telling

I traced the lines on your palms,
counted anastamoses, the points
where lives converge or
diverge.

I tripped on the raised
earth around your roots,
your parents' parents'
house.

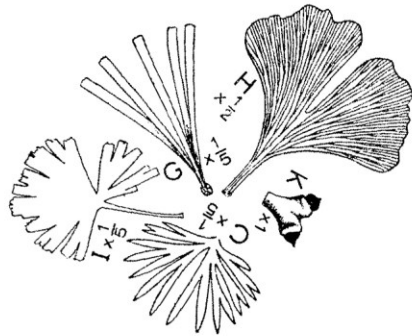


FIG. 35
Ginkgoales

Various fossil : *Baiera* *Arctobaiera Flettii*
Windwardia Crookallii *Ginkgoites acosmia.*

Restless and full of wasps that
tent out the skin of my breasts
and thighs with their soft bulk
shivering.

Jurassic parks

Dan Pearson (The Observer, Sunday 23 November 2008)

I came upon the
Maidenhair tree, Ginkgo biloba

I was drawn to it
through the wealth of autumn colour littering the skyline at
Wisley. The pure, buttery yellow had crept up on the tree in
just days and gathered towards a luminous
crescendo

like someone turning out
a light, first one leaf spiraling to the ground, and then
the whole lot
descending as if a giant had shaken them free
a perfect disc of yellow lay on the ground

a living fossil, a primitive tree
that somehow survived enormous shifts

two distinct lobes, the tail of a
fish or a duck's foot
veins running parallel from the stalk.

I have only ever planted one Ginkgo

THE
NEW PHYTOLOGIST.

VOL. VII., Nos. 4 & 5.

MAY 31ST, 1908.

A CONTRIBUTION TO THE ANATOMY OF *GINKGO*
BILOBA.

By F. J. F. SHAW, A.R.C.S.

I. (On Bias in the Object of Study)

NOTWITHSTANDING the numerous speculations
none appears to have been based upon an adequate
investigation

disposed to doubt
a dozen specimens

employed

A series

cut from

bundles

gradually dwindles away and becomes lost
In some cases

It may be remarked that

we pass

consideration

just above

appearance

it is difficult to draw a line

between

the upper region
and

its central part

II. (On Alcoholism)

NOTWITHSTANDING

investigation adequate anatomical

to view
consisted of
spirit

two one and one
stained

case

collateral
and
gradual

greater extent developed to a rather

These
sections
disposed

of the
normal ,

well-marked

are

crescent-shaped

further up

process in the

space
is difficult to draw
and
sometimes
inverted

The essential feature is
anomalous ,
peculiar manner

the “horns” approach

rapidly

on either flank

the photograph of the model
cut at right angles

. Such a series

is

sterile , the
bottom of the gutter

. It is easy to realise how, the

transition
encircles

general anatomy

. The relationship

is obscured
which comes to lie

in the light of

the
physiological

III. (On Dehiscence)

the organ in question
material
fertile
glycerine
flower a stalk
cut from the base, and
as we proceed up towards the
thickened,
characteristic feature,
the
middle of the collar
the main bundle
right round the convex side
running outwards towards the periphery
round the edge of the crescent
between
and the main
the top
the horns
die out after passing
wings
to the
gutter
mind
supplying the
physiological.

IV. (Metastasis)

Most
are disposed to doubt
the results in the short note.

sections preserved in spirit.
cut by hand, stained, and mounted
the method
well known

the ground-tissue

irregularly
dividing

transfusion

is
they die after passing up the side of the horseshoe-shaped
cavity

the plane

wings

are

stalked

reduced

anomalous to

significance.

Molecular moments

wings flap over
a still lake: twenty
amino acids

thick hydrogen bonds
heavy over spring lakes

hygroscopic
motion, the closed
stomata of cacti

Ginkgo biloba

she is the condensation of peculiar,
of particular condensates, the
culmination of multitudinous
culminations, oriented
as they are from microscopic
to macroscopic, energy
pressed
close
to energy,
wave mingled with light
in hard cold October
under the seam of the water,
nudging a forgotten boat

Terminological Cross-Sections

I. Ginkgoales Early Evolution¹

pteridosperms
Ginkgoales
gymnosperms
Lagenostomales
phase
typology
racemose
morphology
paleozoic
aggregations
morphogenetic
transformations
folear
genera

¹ Naugolnykh, S. "Foliar Seed-Bearing Organs of Paleozoic Ginkgophytes and the Early Evolution of the Ginkgoales." *Paleontological Journal* 41 8 (2007): 815-59.

II. Morphogenesis of *Ginkgo biloba* shoots²

megagametophytic
ellipsoid
plesiomorphic
phylloide
anthophyte
blades
perisporangiate
clades
abaxial
sporangia
lateral
primordia
axil
ovule

² Mundry, Marcus, and Thomas Stützel. "Morphogenesis of Leaves and Cones of Male Short-Shoots of *Ginkgo Biloba* L." *Flora - Morphology, Distribution, Functional Ecology of Plants* 199 5 (2004): 437-52.

III. The Pharmacology of *Ginkgo biloba*³

xenobiotic
ligands
hepatic
splice variants
androstane
metabolism
domain
expression
ligand-receptor
gluconeogenesis
coactivators
lipogenesis
nomenclatures
homeostasis

³ Lau, Aik Jiang, Guixiang Yang, and Thomas K. H. Chang. "Isoform-Selective Activation of Human Constitutive Androstane Receptor by Ginkgo Biloba Extract: Functional Analysis of the Sv23, Sv24, and Sv25 Splice Variants." *Journal of Pharmacology and Experimental Therapeutics* 339 2 (2011): 704-15.

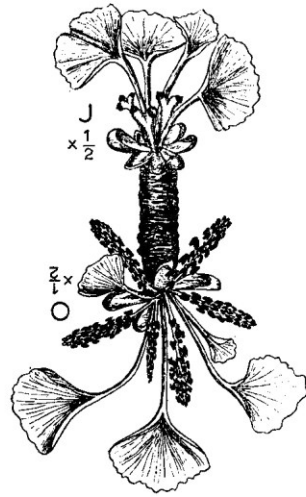


FIG. 35
Ginkgoales

pollination. *Baiera muensteriana*: immature at

One into two

makes many,

where one into one
only makes one.

Many parts never make a whole.

Noetic Obsession

The sticky bitterness coats fingers swollen from hours of pulling leaves apart and grinding them into paste. Sap oozes out of the raw leaf scars left behind, but I continue. Each needle frozen like the last, shattered in the mortar, transformed into its new liquid state. A barbaric way to see into the inner workings. We think we have such delicate, precise instruments, tearing a body up to probe its chemical anatomy. Each piles up underneath the steps of the temple, reaching towards final forgiveness, the cancellation of debt, the sun. It's a slow plodding, the careful brush strokes of each of God's billions of names. We write each new character into our books, forget its trifling smallness.

Separation and Unity

It is one way to allow the pillaging of empty vessels to mean something, the rhizome of my brain slowly sorting through the wants and the want-nots, running each new sample through the high pressure liquid chromatography column, to fraction it by its finest chemical distinctions. Drawing chemicals was always seductive to me. Like learning to write in hieroglyphics, and yet more—a mysterious power over things unseen. Power that destroys the possibility of true-seeing. Instead I have to reassemble unity from the carnage of Linnaeus, allow it to crystallize slowly in my mind. The problem, of course, is self.

Rainfall

My eyes are as sore from trying to balance the world as my hands are raw, from either pen or pestle. I speak words that ring true and empty, at times both at once. I am a river of thoughts that could never live up to their source at the cusp of the world's heights. That must always descend into more convinced, less complex rivulets until they overtake themselves at the edge of the ocean, the tempestuous but denser breadth of consensus.

Fractal Existence

Beings within beings within the heart of the heart of each finger, each cell, each molecule each atom, each vibrating with the excitement of existence. I still myself, gather the tenuous strings of patterns in my fist, and breathe. As between two mirrors, patterns repeat at every scale, upwards and downwards, made solid in my fingers. A temporary scourge of entropy: the strange fluke of atoms close enough to each other that they reflect the sun. I rub the leaf in my hand, run a finger around its cleft.

General Relativity

The desk is relative to its chair, to the books stacked around and on top, to the sun that burns through the windows on an autumn afternoon, draws eyes to the brilliant gold of the tree in the back yard. I am a thousand tiny relativities balanced on the edge of a knife, so helplessly dependent on the air, on the intricate network of trucks and farms and grocery stores that hold up reality, so dependent on plants, on algae, on the thousands of bacteria that colonize my skin, my lips, my stomach. I am an amalgam of life, a patchwork of self and other that I call self.

Thingness

First there was nothing. Or rather, to be more precise, there was one thing, which both is and is not any one thing. So there was no thing. Then there were two, or perhaps more things. The everything-as-one never split, rather one sees that the everything-as-one is made up of parts, of interconnected things. One could say 'this' vs 'that' based on this new category of 'thing'. Each thing can be isolated, made into this thing or that thing and take on its own particular thingness, which cannot be removed. The thing is, words make irreversible things out of the everything-as-one.

Knowledge

The wealth of it breaches in the sunlight, its big belly blindingly white against the scraping of our hands. We claw for any purchase, but end up upside-down, hanging on the trees that grow from the ocean floor; their heads dark and ducking in and out of the waves with no eyes and no gaze. The secret wasn't ever in our ability to put ideas into the air, but to float them up with the hot air of centuries of yearning for life. We are the dust underneath the plated atmosphere, writhing and powerless and full of the idea of water.

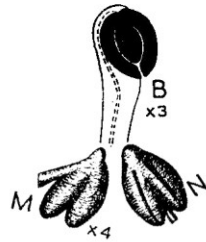


FIG. 35
Ginkgoales

Ginkgo biloba a long shoot short
with young pair of
(dehiscent)

There is a place where the water runs clear over smooth rocks, where black flies get caught in the press of unsuspecting eyelids.

Bruised, sun-ripening windfalls

Their smell is acidic, rancid:
long nights crying,

salt caked onto arms and fingers,
ocean-wind whipping hair,

the mushroom-watermelon
sweetness of rain-soaked sidewalks,

the smoothness of her arms,
musty bookstores,

and piles and piles of leaves
fading from their almost

translucent yellow
to brown.

Hosen-ji ginkgo

She is a hundred years
of forgotten love
promises;

of odes
to fall
and to moon

through the trees;

of skirted ornamental gardens.

She is an icon of

phylogenetic
history,
her inheritance

the entire fortune
of her order.

Her voice
softer than moth
wings in snow,

stairs part
around her roots now.



The Many Names for *Ginkgo biloba*

GINKGO BILOBA L., SALISBURIA ADIANTIFOLIA,

Delicately bilobed,
these ancient leaves

as lined as the wise
village woman, eyes lost
in laughter, or worry?

SPIRITED EYE, NUT APRICOT,

roots cradle rocks,
suck deeply of earth

this small yellow
apricot, browning in
late summer sun

holds a lens
to magnify dreams

MAIDENHAIR TREE, KEW TREE,

each spread of leaf
imitates a tiny head
with golden tresses

waving in the wind
of the Thames

tree cuttings scatter
as if buoyed by wind,
litter sidewalks

DUCK FOOT, SILVER APRICOT,

her branches heavy-laden
with soft new ovules

not silver, but
golden in autumn's
more distant sun,

many-legged, upside-down
duck, head buried deep

GRANDFATHER-GRANDSON TREE, TEMPLE TREE,

this tree passed down
through generations, hobbled
by pruning

thousand year roots curled
against porcelain

FOSSIL TREE, TREE OF FORTY GOLD CROWNS,

leaves brown
and blacken
under the snow

fossils decaying
in our tampered air

PEACE TREE, WHITE FRUIT,

each pit, dried,
the right size, each a
pointed ellipsoid

an empty eye
staring pupil-less

On Becoming Trees

I.

Enter the Permian,
enter the reign of phylogeographical
studies, of reproductively
unisolated trees,
of the smell
of dark moss,
salt water.

II.

I am unfinished,
uncertain,
my memory locked
in the waving palms
of the Cretaceous,

waiting for lost
root companions,
aching.

III.

We are cello strings:
thin-grained, sweetly voiced,
humming into the wind.
Our feet are thousand-toed,
each grasping the rocks
as we creep toward
the horizon.

Ancient Seed

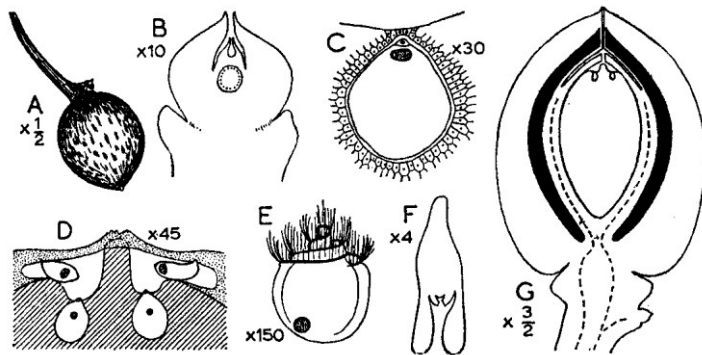


FIG. 36

Enclosed within the integument, fused as it is to the nucellus and enclosed as that is within the deep seat of the collar, is the megasporophyll, the nest of the mother tree.

At the tip of the nucellus, the ridges of integument meet and pull away from each other, their tension palpable.

Between them, a small channel calling for the microspores, for pollen, for the offering of a new generation.

Lines Pulled from Wang Wei and Vegetation Encountered in *Classical Chinese Poetry*, Translated by David Hinton, upon Searching for Ginkgo Biloba or Duck Foot, Maidenhair Tree, *etc*, amongst the Flora of Chinese Poets

I.

pine winds loosen my robe. Explain this
On the side-path shaded by scholar trees,
mountain greens furl into white cloud.

In these forest depths no one knows
among old trees, broken remnants of willow.
Was it in bloom--that winter plum?

I return to my old forest, knowing empty.
Roof beams cut from deep-grained apricot,
among ash-green pine and cypress, then return home.

II.

plum willow pine cypress
cinnabar gold-orchid
chrysanthemum poplar
mulberry tree thorn fern thicket oak
orioles, cicadas

thistle weed bitterroot
fig wild rice pepperwort
duckweed garden willows
white poplars
years tighten

broken-down bamboo and mulberry
elms and willows
emaciate pines

The Birth of Pollen

At the crux,
in the crack between
branch and petiole,
a tiny raised knot
pushes against
its shell, and
bursts forth
in bloom.

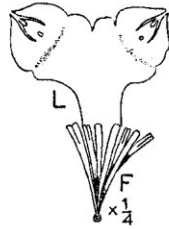


FIG. 35
Ginkgoales

(Chamberlain Florin Knowlton Schimper-Schenk
Harris Wettstein Sprecher)

Seven stones lined up near the edge of the ocean are more than merely crab holes. They trace the path of the tides, arranged by some function of texture, size and shape into the Zen garden of the beach slowly revealed by receding water.

On Breathing

I was the first to drop below the surface of the grass, its green louver slats pressed against my closed eyes. Then it's hard to say whether the others fell asleep as I did, or wandered off for the hours I slept, searching for moon landscapes etched with raked lines, dotted with the stunted growth of three foot, thousand year old ginkgo trees, no longer supple enough to wave in the void's still winds. But when I woke, there they were, unmoved as if they'd been made stone by the rising fiery crescent eclipsed by the earth, or as if their cells had frozen their internal movement, hibernating against the next breath of oxygen. They let their bodies melt into the landscape—aged and twisted skeletons echoing the trees.

Things Left Behind

Following the trail of books back to the source is like sifting through sand searching for a stone the size of my fist.

Winter's sun streams lengthwise through old windows, frames the room slantwise on the floor, an orange quadrangle.

Unabashed, information multiplies itself against the dragging links of the net hitched to the back of our boat.

The Penrose tiling of hand quilted cushions forgotten on the floor next to the couch.

We spent hours trying to speak into each other's hearing aids, then gave up with little time left to the egg-watching night.

Economics

There must always be an eye for an eye except where exponential growth is assumed. Somewhat incidental to the discourse of reason is the weight of air with 120% moisture. So much heavier than the air above the Nevada desert, stifling though it may be. There's only a small type of idea that can be shared in this manner. Everything else is peripheral. One drop or two, it doesn't matter. I am the sunlight I am the sunlight sunlight on ripened grain I do not sleep. Two times pi is the radial modifier to describe the circumference. There are only ever a few ways in which to grow larger than our own understanding of life. Some things are not merely microscopically smaller than our perception, but also atmospherically larger in their eleven dimensions. Protection only serves its purpose if we recognize what it means to protect an environment that is increasingly not our own. I am a thousand winds. It is the unspoken net beneath us that we colour with internal invention. We desire, above all, mastery. It will change its form, and we will no longer be a part of it.

>tr|Q4FFX7|Q4FFX7_GINBI RNA polymerase
beta chain (Fragment) OS=Ginkgo biloba
GN=rpoB PE=3 SV=1
MLLDENKGTSTIPGFGQIQFEGFCRFIDQGLIEELSNFPE
IEYTDQEIESRLSGKKYKSAEPLIEERNAVYQSLTYSSSEL
YVPARLIQKNRRKIQKQTVFLGNIPLMNSRGTFFVNGISR
IVVDQILRSPGIYYSSEPGHNGIAIYTGTIISDWGGRPKL
EIDGKTRIWARVSRKQKVSIPVLLSAMGSNFEEILDNVCY
PEIFLSFLNGRQKRKKYL RSEENAILEFHKKLYCVGGDLV
FSESLCKELQKKSLOQRCELGRIGRRPNQKLNLDIPENE
IFSLPQDVLAADYSIRVKFGMGTLDMDHLKKNKIRISVA
DLLQNQFGLALGRLVNSVRRTIRRATKCKCLPTPKNLVTS
TPLTTTTFQDFGLHPLSQFLDQTNPLTEAVHRRKLSYLGP
GGLTRRTASFRIRDIHPSHYGRICPIETSEGINAGLVASL
AIHAKIGHCGSLRSPFHKISEGSKEEHMVYPSPGEDEYYR
IATGNLALNQGIIQEEQVTPARYRQEF LAIAREQIHFRSI
FPFQYFSVGVSLIPFLEHNDANRALMGSNMQRQAIPLFQP
EKCITGTGLEQVALDSGSVTIAIQEGRIEYTD AENITFS
FNGDTIGTELVLVYQRSNKNTCMHQKPRVRQGE CVKKGQIL
ADGAATVEGELSPGKNILVAYMPWEGYNFEDAILISERLV
YEDIYTSFHIERHGIRTCMTSQGPERITKEIPHLD AHL LR
HLDENGLVMLG SWIETGDVLVGKLT PQKEEESLCAPEGRL
LRTIFGIQVSTARESLRVPIGGRGRVIDVRWIHEEENSG
DNAETVHVYIILQKRKIQVGDKVAGRHNKGIISKVLPRQD
MPYSQNGTPVDMVFNPLGVPSRMNVGQIFECPLPGLAGNPM
NKHYRITPFGERYEREASRKLVPPELYRASEQTANPWVFE
PDHPGKNRLIDGRTGDLFEQPVTIGKAYIPKLIHQVDDKI
HARSSGPYALVTQQPLRGKSKRGGQRVGEMEVWALEGSGV
AYISQEMLT LKSDHIIARHEVLGAIITGEPIPKPGTVPE S
FRLLVRELRLSLAPELNHAIISEKDFQIDKKEV

Sources

Figure 35 is scanned, cut up and reassembled from *The Morphology of Gymnosperms; The Structure and Evolution of Primitive Seed-Plants*, by K. R. Sporne (1965). The figure used in “Ancient Seed” is taken from the same text.

The found material in “Jurassic Parks” from *The Observer*, accessed through the online site for *The Guardian*. The found material for “A Contribution to the Anatomy of Ginkgo Biloba” was originally published in *The New Phytologist* in Volume 7, issue 4-5. The full citations for the “Terminological Cross-Sections” are contained within the poems themselves as footnotes.

The amino acid sequences for RuBisCo large subunit and RNA polymerase beta chain book-ending the manuscript were pulled from GenBank on November 7th, 2012.

The final lines of “Ways of Knowing” written after the final lines of “Elora Gorge I” from Christopher Dewdney’s *The Radiant Inventory*.