

KAREN HAYS

Dear Martlet

1. WORDS

There are words you haven't learned yet that apply to you perfectly. The good ones I keep like butterflies from the car's grill or that bird skull from our garden, like stories from my childhood—all things you are greedy for. I save them to turn out into the damp creases of your cupped hands, the white folds of your liquid memory. They are vacated waiting things, bits of life once-removed, half-truths and cicada husks. They keep about themselves some of the heft, a want of the spark, but all of the bittersweet transience of the living.

Someday I will tell you that you are a Taxonomist. For now I watch you, a first-born, flop-mopped son who sees with blue eyes past the bump on his nose that matches in miniature the one on mine and my dad's and his mother's, who swears hers was as smooth as anything before it was broken. I watch you with your field guides and your colored pencils and the knot on your unbroken nose and I know how you know things. You line up by features the beasts whose breath and wing-beats turn the rotors of your mind, that make it go and go and go. Then, to still the endless whirring, you call roll. You are a pattern-maker, a naturalist, word-lover, sing-singer, list-maker, and a Serious Collector. You are namer of things, a Taxonomist. Someday, when your palms have grown bigger, I will tell you.

2. THE FIRST

The white-haired boy known to his schoolmates as Little Botanicus was born in the springtime three hundred years ago. The first of five children, he lived his birth year in the Småland Province of Sweden with his nineteen-year-old mother, Christina, and his thirty-three-year-old father, Nils. Sunlight divided the family's time by day and by season between their small grass-thatched hut and the carefully tended garden that grew alongside it.

Nils was an amateur horticulturalist and the summer before Little Botanicus was born, he toiled in their Småland garden over a floral facsimile of a feast. In Nils's baroque fancy, plants grew to represent everything from dinner guests to table settings.¹ Some say it was

the pleasure pregnant Christina took in this garden that made their fair-haired boy turn out the way he did. Some say the feast affected her as thoroughly as if she had eaten and drunk from it, with the result that their fetal son's mind was trained, like some vine around his father's trellis, to love all things that willed themselves with sunlight from below the ground or water.

That may be so, but there is also this: Little Botanicus dreamt his germinal dreams in a cradle over whose sides Nils hung fresh-cut flowers.² So that among the first things Botanicus knew, over the months his eyes were turning brown from blue, were these: the coming-closer sound of a deep voice whose footfalls were heavy; the single sun-baked smell of man, loam, and nectar; and then, the faceless shapes of flowers whose colors drew bees and strength by increments immeasurable, by sunlight, by the day, like his eyes. Some say.

3. COLOR GROWING

Some say.

But no one has reconstructed how long it took exactly or how things looked to him along the way. His color-growing months were timeless and nameless, full of the kind of change that only pre-remembering beings (infants, beasts) could withstand. In them, the cone cells of his eyes multiplied and matured, giving him to distinguish, if not name, somewhere in the neighborhood of 2.3 million colors.³ All from only three different kinds of photoreceptors, each hard-wired to his fast-growing brain, each registering light according to its specialty in the wavelengths of blue or green or red. So that he could better know flowers.

For his eyes, he was unique among mammals, but not mankind. Most mammals only see underwater colors, colors that slide between blue and green. But we humans see flesh, flower, and fall tones too: shades of red, orange, and yellow, the so-called warm colors. Three-color vision is thought to have arisen in primates when our jungledwelling ancestors made the switch from nocturnal to diurnal living and needed to distinguish the ripeness of fruits and leaves. (*Homo diurnis*, we *sapiens* were first, but for a short time, dubbed.) Some say the yellows and oranges of certain tropical fruits coevolved with the unique ability of Old World Monkeys to appreciate them. Some say Carolus Linnaeus named the banana *Musa paradisiacal* because he

believed its yellow fingers grew from the Tree of Knowledge, whose forbidden fruit (though so often seedless) appealed to our species in order to propagate its own. Some say.

Bees are the ultimate propagators; most agree their color vision helped shape the evolution of flowering plants. Before flowers, plants spread pollen by producing lots of it and leaving it in cones for the wind to blow around. Then, by about a hundred million years ago, some plants were sparing energy from pollen production in order to package it more appealingly, and bees, with their color-seeking eyes and bottle-brush bodies, made their inadvertent trade too: courier services for pollen and nectar. And so pollen came to be carried like a wordless language, like a secret code or evolution itself: by fruitful accident on the backsides of bees.

There are two blind spots to a bee, one under its proboscis and one on the middle of its back. Pollen grains suck onto the bee from the static cling its wings constantly make, and the bee cannot reach those two places to comb the nutritive dust free. Some flowers shower the bee all over with their reproductive stuff, while others target these two safe sites, their stamens positioned to dollop the grains, each one a microscopic marvel, each a fingerprint for its species, exactly there, exactly when the bee reaches for its nectar. Some flowers achieve cross-pollination by trapping bees, pressing them into tight spots so that their previous host's pollen must be scraped off before the bee gets its reward.

And then, from her egested nectar and a trillion wing-beats to thicken it: honey. For animal, man, his indomitable gods and mellified mummies; for antiseptic, preservation, food, mead, and medicine; from tongues to legends through the combs of our memory: honey.

In ancient times it was believed that if bees visited a baby's cradle and hovered near its mouth, the insects were gifting the child with mellifluence, or a honeyed tongue. It has been said that bees swam in the breath of the infant Virgil of Rome. The texture of our very lung-covering is honeycomb. Our bronchi branch like family trees.

In *Sweetness and Light*, Hattie Ellis writes, "In ancient Greece, bees flying through the cracks of rocks were thought to be souls emerging from the underworld, just as the ancient Egyptians believed the insects to be human spirits that could fly anywhere." ⁴

Fly anywhere, we do too. Neuroscientist Endel Tulving says that the ability to mentally time travel may be part of what separates us humans from bees and Old World Monkeys.⁵ Only we have story-like memories that cannot be groomed away by a good night's sleep, that can be played both forward and back. This is called episodic memory. Other animals learn things of course, but their ability to revisit the past or envision the future in a kind of self-referential, dream-like state appears not to bridge what Tulving coined "the diurnal divide." When I think of episodic memory and how it is kept, I imagine the safe sites on bees where pollen like pro-genetic language gathers, like family names and family stories, to be passed down. I think of the calluses words pile on the longest fingers of our preferred hands. Other animals stock knowledge of their past in something ironically called semantic memory. Language is a part of what helps humans remember. Naming helps us.

But we are not the only ones who use it. What worker bees do with blue sky, whirs, and turns, I would need at least a compass, meter stick, my feet, and some figures to do: tell my sister exactly how far away and in what direction to find a specific bunch of flowers. Karl von Frisch named this language the Waggle Dance. Language helps us remember. Naming helps us.

Karl von Frisch named the Waggle Dance and he also figured out that bees see polarized ultraviolet light. To a creature that can see the directional component of light, Frisch said: "even a spot of blue sky can disclose the sun's position."⁶ That is how, at any moment on a clear day, a bee can report the exact location of a food source relative to a reference point that is always on the move.

Like humans, bees see color in combinations of three, but instead of red, blue, and green, bees see blue, green, and UV. Compared with human vision, this is a shift in the electromagnetic spectrum toward shorter wavelengths; it means that bees are blind to the color red, but see *extra* purple. A purely red flower, say a spring tulip, would look black to a bee but with a purple UV glow invisible to most humans. Many flowers reflect UV patterns that we are blind to, like the bull's eyes hidden in Black-Eyed Susans, and the nectar guides that radiate like landing strips from the centers of certain lilies. Those come-hithers are for the bees.

UV is damaging to human vision, which may be why our eyes are guarded against seeing it. But there are some who can. People

whose eyes have clouded over with cataracts as a result of the sun's rays sometimes have their lenses surgically removed, the unintended benefit of which is the ability to see some light in the UV range afterwards. Dark brown eyes are most susceptible to the UV damage that causes cataracts. Monet painted his water lilies bluer after losing a cataract-clotted lens in 1923. He had cataracts in both of his brown eyes, but would only submit to the removal of one lens. He described the change in his vision, first the yellow blurring caused by looking through the opacities, and then the one-eyed bluing, followed by the distortive overlay of corrective lenses, as "quite terrifying."⁷ You can see the effect in his paintings over time. His landscapes gradually turn redder and then, after the surgery, more blue. Ironically, it had been Monet's passion to capture the ephemeral nature of seeing; he painted the same settings under all conditions of sunlight—in different seasons, during all kinds of weather, and at every time of the day. "Color," he said, "is my daylong obsession, joy and torment." This is what he said:

Color is my daylong obsession, joy and torment. To such an extent indeed that one day, finding myself at the deathbed of a woman who had been and still was very dear to me, I caught myself in the act of focusing on her temples and automatically analyzing the succession of appropriately graded colors which death was imposing on her motionless face.⁸

He also said this:

I am following Nature without being able to grasp her.... I perhaps owe having become a painter to flowers.⁹

To Monet, blindness must have come like a presentiment of his own death, like colorblindness to a bee, or beelessness to a bloom. Or sunlessness. The garden-cut buds that unfurl in my kitchen jar do so with pitiful, abject paleness.

New eyes need daylight too. In their Vision Research article last spring, B. Laeng et al. show that above the Arctic Circle, in the land of polar night and midnight sun, where daylight dwindles to nothing in winter and human eyes are most often blue, people born in dark seasons grow up with decreased color sensitivity compared

with those born in brighter months.¹⁰ In their study, winter babies tended to suffer duller greens while the summer-born, like bees, birds, and the lens-less, had heightened senses of the color purple.

Sunlight has short term effects on seeing too. According to B. Laeng et al., reading in bright sunlight for just one hour skews color perception for several hours afterwards. Perceptual psychologist Eric Schwitzgebel says that when it comes to color, reading makes a good comparison with dreaming.¹¹ Schwitzgebel argues it makes no more sense to talk about dreaming in color than it does to talk about reading in color. In dreams, the objects that are colored are the ones that fall under the narrow beam of our color curiosity. The beam width is restricted by how many details we can hold in our minds' eyes or "picture" at any one time. The rest of our dream imagery fades not into colorlessness so much as into color-irrelevance. Like when we read, or mentally time travel. Schwitzgebel notes that the first reports made of dreaming "in black and white" co-occur with the advent of black and white movies, probably because movies are most like dreams—immersive and visual. Absent anything closer, we can't help but compare. But we do not dream in movies, propelled along by fully rendered, flicker-fused worlds our minds' eyes are free to rove over and explore. And we do not dream in black and white, except to the extent that we dream in text once-removed. And we do not dream in color.

Still I wonder: how soon if ever after Monet's lens was removed did he begin to dream in ultraviolet, or in a dreamscape altogether "quite terrifying"? And in the morning, did he feel a kinship with the UV-seeing dragonflies—those color curious beams—that must have alighted on his beloved garden's water lilies, having emerged in spring after a long nymph's life underwater? And I wonder this: how many times has the carbon of those white lilies, themselves materialized sunlight, been rekindled and in how many life forms since they were immortalized on canvases that hang now in UV-guarded galleries the world over? And how many generations must pass before an organism is conceived that chances to so inspire us? And how laughable, how minute and how bounded, is our wall-hung version of immortality when taken from the perspective of an atom, whose currency, like ours these days, is the electron?

Life goes on outside of the beam. That is what dogs us when we try to recollect the slippery parts of memories and dreams: the

unnamable qualities that proliferate in the pitchest parts of the dark, that line the illumined cone, that crouch in its color-shocked periphery. Even as babies we fixate on the visual edge, we stare at seams, our limbs and tongues pumping.

The year I was born, not three hundred but closer to thirty years ago, Karl von Frisch won a Nobel award for decoding the Waggle Dance. I wonder if my parents read about it or heard mention of it on the evening news. I wonder if reports of it passed over me where I lay color-growing in my crib, where I was helpless to care or decode so many kinds of sound waves. When I play at remembering what infancy was like, how it felt to struggle wordlessly between the weird and disparate worlds on either side of my skin, I remember a movie I saw—that one about the man who had Locked-In Syndrome and dictated his autobiography in blinks. *The Diving Bell and the Butterfly*, I think it was called. I mistake empathy for remembering. I make up memories from pictures. Most of my early memories I've scripted from photographs my mother tacked down with black triangles to photo albums. They are semantic memories, monkey memories, not episodic memories, not the kind that make up mental time travel. Those are not overwritten, I've read, but over-wintering somewhere, retired under water like birds of Swedish lore. I can dredge a few up with effort, but in daylight they look to be species of a shifty, different-seeming beast, each remembering having evolved irrevocably from the last.

In the guest room closet of my mom's house now there is a shelf lined with photo albums, each identical, save for the slanted numeric labels she made for their spines: 1973–1976, 1977–1979, and so on. I can still hear the tear-back of the plastic sheets that held the pictures just so, that protected them. The sound comes to me in my bed because she worked on the books at night. The soft drone of the TV and its sometimes blue flashes change my room, mess with my dreams. In the morning I like to flip the stiff pages of my mother's books, see the progress I've made growing up. Each picture is like a type specimen along our family's own ontogenetic tree: One Year Old, Christmas, Birthday, Camping, Glasses, Divorce, Apple Picking, Halloween. "Dappled and brindled," that is how psychologist J. D. Mollon describes the luminosity that confounded our fruit-loving ancestors; we need extra help for the verges.¹²

I go to sleep but sometimes in my dreams, both as a kid and occasionally now, I only have peripheral vision. The stuff in the middle is blotted out by flash-bulb white. When I look to the sharper, darker edges, the images incinerate from my focus and so I turn to some other spot, hoping to catch a form if I am fast enough, hoping to pull up some part of it, any part of it, not smoldering for a change, but intact. Followed or following, I too am unable to grasp. In the morning it is a relief to open my eyes, to flood my rods and cones with sunlight and the instant, effortless mechanics of seeing.

Sunlight sanitizes. It burns. Its sinuous rays overexpose film, endanger masterpieces, and dull the photographed faces of loved ones and lost youth. Even though it is utterly invisible to most of us, UV fades the evidence we make of our lives, pushing the past into a place ghostly remote. But long before that, before any of us knows or cares a fig for our own mortality or the mortality of our parents, while we're still growing color and mastering object permanence, the concept that keeps us looking for obscured things the rest of our lives, ultraviolet performs its most intimate act: UV paints the iris, that muscle shutter we use to click off life's countless beats, that is unique as any pollen grain or fingerprint. Sunlight darkens the melanin in the irises of newborns whose eyes, like Little Botanicus's, were written to be anything other than blue. When heading out to the garden to work, Nils often brought his blinking baby along, placing him gently in the grass nearby and offering him flowers to hold onto.¹³ This not only calmed his infant son, but also afforded the future Flower King the same view heavenward as was designed to tempt bees: blooms before ultraviolet.

4. BEE TREE

It is summertime and Little Botanicus is a month into five years old and the days are so long in southern Sweden now he never sees the night. His cheeks are red and the bubbles on his nose have popped and sent clouds to drift over his freckles. His hair, a muss of straight white, is stuck down with sweat to his forehead and temples. Now that he is five, his father has given him a plot in the garden to work all on his own. His father is growing a new kind of South American vegetable. Today they kneeled to part its purple flowers. They felt with their palms and their minds' eyes for the burgeoning brown tubers below. Before summer is out, Botanicus will have had his

first bite of potato. Before the year is out, although Botanicus doesn't know it yet, he will vacation to a house near a lake, the kind under which barn swallows are said to overwinter, and take his first taste of cane sugar too.

To cool off today, there aren't Swedish lakes tempting with dips, but the shade of trees. Little Botanicus lies beneath a linden on the grounds of the rectory where his family now lives, his head propped on a hard root hummock, his knees in the air, his fingers tearing at the dark leather of a heart-shaped leaf. It is summertime and he is five and he looks from the veins of his serrated leaf—the paper-fine lines he tries so carefully to steer the rip around, but can never all the way—up to the branches above him. He sees how they are the same—the leaf and the tree—how their lines divide, how from one there come so many more. He knows it is important.

Above him in the linden there are bees come to collect for their honey. They dip into the white-yellow flowers, pack their leg baskets with pollen, suck the heady nectar, and fly their incomprehensible flight. When the wind blows, the bees are shushed and leaves blink silvery undersides. Spilled pollen from bee baskets rains down on Little Botanicus. As long as it is light out, the bees fly back to fill their honey stomachs.

Botanicus keeps asking, but Pappa says he won't tell him any more of the plants' names until he has memorized the ones he's given him already. Some of them Botanicus knows, but likes to hear from his father's tongue, like a prayer, for the sound and soothe of it. Others make no sense; they are too-long names with no music or meaning; but to keep his father teaching him, he will do his best to remember; he will make the names into songs and sing them to himself when he is alone, over and over.

They say if a dragonfly goes round your head more than two times it is the devil weighting your soul.

And the swallow was a girl who stole her fairy mistress's red spool and scissors. Now she must wear what she took for throat and for tail and now everyone will remember. Now she hasn't any song to sing to herself when she is alone, over and over. Poor bird who swoops the fields and scoops the lakes without a song to sing forever.

Little Botanicus looks up into the noisy canopy. Bees make the magic mead that pours into hopeful mothers, that turns their first babies into luck-born boys. Like him. What do linden flowers do?

They are pale spiders dropped down green silken strands. They shudder and tap too many orange feet. They suck up bees and, stung, spit them buzzing back out again. Everyone knows the linden is a Bee Tree; it hums and it smells like being born and its honey is white and tastes like wet sunshine and, just like the bees, for the few weeks it is blooming, Little Botanicus forsakes all other flowers.

5. THE FATE OF MEDIEVAL SWALLOWS¹⁴

At least as far back as ancient Greece, oval stones from swallows' stomachs were used to remove accidental objects from the eye. The best eyestones were obtained from the bellies of the unfledged first-born birds, whose wings would never know sky, whose feet would not spoil from landing. The best eyestones were red, not white, not mottled.

In the Middle Ages, the ashes of burnt mother swallows were mixed with honey and given as a treatment for whatever ailed the eye. Her ashes, blood, and nest mud were all common apothecary stock. Southern European children were given her still-warm bird heart to eat to help them grow up wise and learned, to improve their memories. Coated in the bee's white wax and strung round a northerner's throat, the swallow's heart was sure to bring its wearer good fortune. A pretty girl's heart was said to beat with a swallow's wings. A boy bright in his studies was to have swallowed the bird's blessed little heart.

6. THE TAXONOMIST'S FAMILY TREES

Nils named his first son Carl for the king, but not Carl Nilsson (son of Nils) after the patronymic custom in eighteenth-century Sweden. In order to matriculate at the University of Lund, young Nils had needed a proper surname. Like his uncles before him, Nils replaced his peasant name with one that honored the spectacular old triple-trunked linden, or lime, or bee tree that grew on his family's homestead. Where his relatives took the surnames Tiliander (from the linden's latin name *Tilia*) and Lindelius (from the Swedish version, *lind*), Nils chose Linnaeus. Nils's two sons would also have the last name Linnaeus, his three daughters, the female version, Linnaea.

When Nils became vicar of the local parish, and moved his family to the rectory in Stenbrohult, he planted three linden trees, one for each surname of the lind-loving family. The three-trunked tree from

which these clergymen all claimed their names was the family's *vård tråd*, or Warden Tree; it was supposed to have been inhabited by protective spirits and was a favorite of both moths and bees.

7. BLOOMS BEFORE ULTRAVIOLET

Like human infants, members of the *Apis* genus are extraordinarily nearsighted. With compound eyes, a bee's view of a thing isn't replicated like a bank of televisions in an audiovisual store, but pixilated, like a look taken too close to a single screen. (Conjure in your mind the pseudoisochromatic cards used to detect colorblindness, what secret digits are encoded in those circles.) Still, it is the sense of sight which is the bee's keenest. Contrary to popular thought, it is sight, and not smell—a sensation too subject to the vagaries of wind, and which bees probably possess in no superior faculty to humans—that draws bees to flowers.

Karl von Frisch used the flowers of the linden tree in his experiments with the perception and language of bees. Here is something like how a bee might experience a linden.

When flying upward into a linden tree in full bloom, a bee registers the tree's foliage as a break in the pure ultraviolet, or bee-purple, of the sky. Vegetation absorbs UV. What the bee sees are the tree's white blooms. Since human white is a combination of light in all three of our colors' wavelengths, and bees don't perceive red, white flowers glow blue-greenish for the bee. Blue-greenish occupies a position opposite ultraviolet in a bee color wheel; it is its color compliment. That is why most tree blossoms are human white. It is the most attention-getting for bees and other red-blind pollinators.

Since its keenness of vision resides in its ability to sense not only color, but also movement, a light breeze will make the tree's flowers easier for the nearsighted bee to find. Too much movement frightens it off. Bees don't have eyelids; their eyes (there are five of them, two compound) are always open and they capture images ceaselessly. If a bee were to find itself in a movie theatre, it would see the film's picture frames (thirty per second) bracketed by stuttering black blinks. This is flicker fusion potential and bees have it in spades; it enables them to react fast.

Once a bee braves to alight on its bloom, and can see it closely, there are the color-contrasting stripes of stamens, or nectar guides,

to draw its proboscis and pollen-brushed flanks further in. As the bee sips from the flower's nectary, its olfactory organs, positioned at the tips of its antennae, map the flower's fragrance. The scent will be familiar from the smell of worker bees who have already made the journey between the tree and the hive, and been rewarded with pollen and nectar.

And so, in the same way a bird of passage need only make the migratory route once in order to incorporate it, and the savant need only trace his leaf one time, the bee's brain is forever written on with flowers.

8. EMERGING, DESCENDING

When darkness falls, the Bee Tree is alive with another beast. At night in the summertime, while beneath thin lids the boy's eyes tend the landscape of his dreams, his lashes rippling like millipede legs, and the lyrics of some homespun song playing in his head, the Linnaeus *vård tråd* is all-over covered with moth wings. Moths, whose senses of smell are so acute that a male can detect a single female from a distance of miles using scent alone, are powerfully drawn by the fragrance of the *Tilia* tree at night. They flutter out from daytime hiding places.

Bees are blind by dusk, but moth eyes are bigger and they let in more light. Even though they are uniquely able to discern color in the dark, it is light that they seek. What helps guide them to the linden tree are the long upturned bracts that curl, one to a cluster, over each stem-full of flowers. In the daylight, these willow-like tongues are a papery, lighter green than the tree's dark, heart-shaped leaves. They obscure its tiny white flowers. And at night, when color fades for humans and honeybees, the bracts lap whitish at the moonlight, tempting the thirst and dusty slapping of moths.

In the rain, the bracts are flower umbrellas, keeping pollen for nectar feeders.

When daylight shortens in fall, green gives way to what was all along beneath it—orange, yellow, red. The linden's leaves turn golden and get sloughed like drones from their feted queen—on the wind, its bracts holding tight between the fruits and their branches.

Many bracts will hang long into wintertime, clutching below them a cluster of darkened pea-sized fruits. Then the bract is every plumaged part of a brown bird and the *Tilia* tree is all-over strung with

them, each bird clinging to its branch by a twig beak. The stems that hang from the brown keel are its bird legs. The hard fruitlets that dangle (where once there were flowers) are the toes of its winter feet. They knock together in anticipation of fledging. And then, with the seeds entombed, the snow on, and the days sufficiently short, one by one the birds and their drupes take flight. They go one-winged dizzily down.

9. FLEDGING

In the autumn of his seventh year, Little Botanicus was sent away from his family and the rectory gardens to live with the tutor his father hired, a twenty-year-old clergy student named Johan Telander. Telander, whose charge it was to teach Botanicus to read and write in preparation for admittance to the local school, was a stern master. Botanicus spent his daylight hours studying alone in their shared room while Telander attended classes. When he did a poor job remembering his studies, Telander gave him a birching.

After two years Botanicus was permitted to begin the long series of lessons necessary to become a priest like his tutor, uncles, grandfather, and father before him. But the boy who would be the Father of Modern Taxonomy preferred to be outdoors exploring and collecting things; he skipped his classes and failed at his studies. There were few books so everything had to be learnt by heart. Small for his age, he was known by his classmates as Little Botanicus.¹⁵

10. BIRCHING

It is the middle of winter and he is not yet ten and he has been sent outside to cut and bundle birch tree branches. It is cold and the days are so short in southern Sweden he hardly ever sees the sun.

Outside today the sky is poured from the dark of Sweden's blister steel, the birch from her full moon's white. He knows he shouldn't, but he enjoys this part of his penance. His mind steals these moments out of his eleven-hour school day to savor the mysteries of trunks and branches. He makes slow work of the birch sticks and limbs and with numb fingers peels back the white paper bark when he finds it. He leaves them—scrolls lined in unwritten language—to curl and crunch under feet. Above him, the tall trees lean into the schoolyard's clearing. Birch is slight but gregarious. Below him, they reach their roots out far and shallow, making a

kind of living bandage over the land, holding its disturbed soil fast, like underground nests in upside-down trees, with only day's dark sky to moor them.

He knows it's the bend in birch wood that makes it the best for this. Soaking the rods in water first makes them even more flexible and gives the meaner beating. Outside now all water but the salty Baltic is frozen. He thinks of the blue-purple swallows nestled safely under the ice of Swedish lakes, torpid with crossed wing tips and scissor-cut tails. Shuttered eyes. Faint hearts. He remembers the sugar by the lake. The lake in the rocks. The rocks in Sweden. Sweden of the world. The world unto heaven. A light snow dots his dark blonde hair with bird down.

11. SWALLOWS AND THE AGE OF ENLIGHTENMENT

Experiment the first, take five or six Swallows, and tie a weight to their legs, and sink them under water. If they survive after lying therein seven days, who will doubt their living in the lakes! But it may be objected, this is forcing them against nature....
(P. Collinson to C. Linnaeus, September 15, 1763)¹⁶

My next experiment that I recommend to be tried is, as near as can be to the time of Swallows going away or migrating, let half a dozen or more be caught, which may be easily done in the night with a net, whilst they are at roost on the reeds and willows. Have a large wide tub ready filled, a foot deep, with mud or sand, then fill it with water within a foot of the brim. Let a broad board float on the top of the water. On this board put the Swallows, and then cover the tub with a net; so leave them in quiet. This should be repeated every day with Swallows until no more can be found; and if after one or two month's time they are taken out of the water alive, then the fact is proved. As you are very certain of the period of Swallows going and coming, some persons of probity should be set to watch their motions. As their numbers are great, it is unlikely all could conceal their going down in the water. If they do disappear in this manner some in so many must be discovered; and soon after some fishermen should be employed to drag them up again. In the spring, at their return, some persons should be appointed to watch their coming out of the water, in their languid

and wet state, and how long afterwards they lie drying before they be fit for flight. (P. Collinson to C. Linnaeus, May 20, 1762)¹⁷

12. THE FATHER OF MODERN TAXONOMY

Eventually his teachers advised Little Botanicus abandon books in order to begin learning a simple trade. Consolation came to Nils in the form of a highly regarded local doctor, Johan Stensson Rothman, who volunteered to give Carl private botany lessons. Fearing her reaction, Nils avoided for more than a year telling Christina that their son was not destined for the priesthood, but would instead pursue medicine, a heading under which botanical studies then fit and which garnered little pride from the daughter and wife of a vicar. As for Carl, it is said that he would never forgive his father the savagery with which his studies were pressed upon him as a boy, the beatings that accompanied them. Of the five siblings, Botanicus alone would be absent from his father's bedside when the role of family parson fell, as from a fist gone limp, not to the first-born son, but to Carl's younger brother Samuel, a man who would later be known as Bee King.¹⁸

Johan Stensson Rothman introduced his pubescent student to a treatise on flora and their sexuality. Imprinted as he was on flowers, Linnaeus's imagination soared to descriptions of the intimate and self-serving lives of plants. He studied their reproductive techniques tirelessly, translating them into unabashedly erotic terms, in spite of accusations of blasphemy and even harlotry. Flowers, he claimed, were bridal beds. Stamens were husbands and stigmas wives, or, as necessity dictated, concubines. He wrote of floral polygamy. He proposed a sexual system of classifying plants based on their numbers of stamens and stigmas. He became known as Flower King.

Even though he would never be a priest, Linnaeus persisted in the notion that his was spiritual work. "God created, Linnaeus named," was his refrain. To name, he devised a conveniently nesting structure into which things could be placed depending on their shared observable characteristics. From most encompassing to most unique, the taxonomic ranks were these: Kingdom, Class, Order, Genus, and Species. Under his scheme, the taxa of the plant, animal, and mineral kingdoms were all to be given simple Latinized binomial names based on their genus and species. Like *Apis mellifera*, for the common honeybee. Prior to this, there was no consis-

tent nomenclature among naturalists. Names were long, containing up to dozens of words, and often nonsensical. It is said that a fish native to Little Botanicus's Swedish streams had a name that was sixty-three strings long. Try making one of these up for an animal you know. The terms for different organisms varied so widely from naturalist to naturalist, there was no reliable method of conveying information back and forth about them.

His first edition of *Systema Naturae*, published in 1735, was ten pages long, but Linnaeus's thirteenth and final version, published in 1770, classified and named 15,000 species in about 3,000 pages. His surname's initial, the letter "L," appears by way of credit after the scientific names of these plants and animals where they appear in the literature today.

Linnaeus's naming system was based on the assumption that all organisms possess certain identifying characteristics that are visible to the naked eye. Like the number of veins in a bee's wings. Linnaeus admitted the naming scheme was artificial, designed to convenience the taxonomist. It was, of course, ignorant to the role of genetics. It assumed that species were immutable. Its laws required scientific names to be immutable too. (Linnaeus named the honeybee *Apis mellifera*, or honey bearer. Upon realizing his mistake, he tried to change the name to *Apis mellifica*, or honey maker, but by his own tenet of anti-synonymy was prevented. The first name stands.) That its bifurcations turned out to be a decent fit for the mechanics of evolution was either serendipitous or a reflection of Linnaeus's intuition about what branches, for it predated the first graphical depiction of an evolutionary tree by more than a century. That was done in 1859 by the legendary Charles Darwin, a man remembered fondly by his son Francis as "often lying under one of the big lime-trees, with his head on the green mound at its foot."¹⁹ Maybe there were muses that dwelt sibilant in the hummocks of those family lindens. Or maybe it's just that trees had already perfected what any solution hopes for: poetry, parsimony.

13. HOMAGE TREES

If a family tree falls onto a burial cairn somewhere in a southern Swedish forest and no one is around to hear it, will it make a crack and thundering sound? Will moths fly out with linden splinters? And bees from between toppled rocks?

When the Linnaeus's triple-trunked warden tree fell over in 1820, crashing into a Bronze Age cairn that had been stacked to keep some spirit from rising for centuries, smashing to the ground where superstition dictated it remain untouched forever, did it make a sound?²⁰ Or did it make two—one for moths and the other for bees, both in waves of non-human frequency? Were secret records writ on the tympana of unnamed forest sprites, now celled in the spongy pulp of a moss-taken tree, now strung on the filaments of a great gilled fungus, now tangled in the root strings of the forest's modest flower, now tumbling in her elusive bird's gizzard—unfound, unfondled, and not honored forever?

Discoveries and things not to be touched: 274 years ago Carl Linnaeus embarked on a horseback expedition to the mines and mountains of Dalarna Province. He was twenty-seven years old. His assignment, put to him by The Royal Society of Sciences at Uppsala University, was to find what remained unplumbed of Sweden's economically viable natural resources. It was there in the northern climes of Dalarna that he first saw the midnight sun and met his future bride.

Before he would consent to the marriage, Sara Elisabeth Morea's father required Linnaeus take his doctoral degree. So, in 1735, the same year that his first edition of *Systema Naturae* would be published, Linnaeus moved to Holland to complete his dissertation. He was in the Netherlands one week before defending his thesis. Ignorant of the role of the mosquito, he proposed muddy water as a source of malaria and promoted treatment with the bark of the cinchona tree (*Cinchona officinalis*, L.), a quinine-containing substance. A replica of the wooden lectern where Linnaeus stood is currently on display in a Dutch museum. I imagine it polished to a high shine and barricaded behind velvet rope and stanchions, kept from degrading acts of reverence or the opposite.

Like these: on the centennial commemoration of Linnaeus's birth, an anonymous poem was found framed and tacked to the wall of the grass-thatched hut in Småland Province where he was born, where Nils first feted him with flowers. It read:

Between the spruce the birch stands
And speaks Swedishness autumn and spring
And on each birch trunk
The name of Carl Linnaeus is carved.²¹

I like to think of the boy's name spreading by cuts on the white trunks of the old trees whose wood was once used to beat him—letter by letter, tree by tree, stand by stand—and curling off to crunch underfoot. Everything spreads.

Last spring Swedish geographer Leif Kullman reported discovering the world's oldest living tree.²² It is a Norway Spruce (*Picea abies*, L.) growing in the mountains of Dalarna Province. Carbon dating from a lab in Miami puts the tree at 9,550 years old. Kullman says that it would be unusual for spruce to be growing in that region 10,000 years ago. He suggests that humans brought the species with them as they migrated along the receding ice sheet subsequent to the last ice age. (Like the way Native Americans, in whose teepees' poles dwelt "barn" swallows, brought the birds with them in their eastward expansion across North America.) Today their descendents are discussing whether to put a fence around the historic tree or not.

Linnaeus's discoveries led him to recommend the people of Dalarna float their giant forest trees downriver to sell for ship-making, and, rather than grind up bark to stretch their bread flour, grow potatoes. But many were leery then of the exotic-seeming vegetable (*Solanum tuberosum*, L.) that had crossed an ocean and hemisphere by boat, that Linnaeus had grown with his father in their long ago rectory garden.

A little over a century later, when potatoes were a European mainstay, *Phytophthora infestans*, or Potato Blight, spread by wind from Mexico through the United States and then by boat across the Atlantic. *Infestans* turned European tubers into rot. The Potato Famine migrations began and many Swedes took up residence in North America. Most of the emigrants from Småland Province wound up in the geographically comparable state of Minnesota. It is the North Star State and The Land of 10,000 Lakes. Under the Sister Cities International program, our town of Minneapolis is twinned with Uppsala, the place where Linnaeus collected, named, taught, gardened, fathered, wrote, and died. Our boulevards, continually cleared of elm trees sick with so-called Dutch fungus, are now lined with more and more little hearty-looking lindens. Contagious elms are marked with a sprayed-on orange ring and some city inspector's initial. In my neighborhood, the letter is "K." Everything spreads.

Of the plant kingdom, the one Linnaeus claimed was neither birch nor spruce, but Twinflower (*Linnaea Borealis*, L.). He adopted it as his personal symbol when he became a member of Swedish nobility in 1757 and changed his name to Carl von Linné. Today Twinflower is the emblematic flower of Småland Province. On the Linné coat of arms, the cartoon plant flows as a garland from his helmet's ruffed crest. In real life, *Linnaea* grows on the dark mossy slopes of arboreal mountains. It is regarded as an indicator species, its presence suggesting ancient woodlands. It is likely that Kullman trod among Twinflower on his search for the world's oldest living tree.

On the aging of trees, Leif Kullman explained this: the oldest any spruce trunk can ever become is really only six hundred years old; when the spruce dies, a new, genetically identical tree forces its way out of the dead one. These are called clones. In winter, the lowest branches of the dying spruce are pressed by piling snow into the ground. That's where the clones take root. The world's oldest living tree is a composite of at least four different generations of clones. Global climate change has given recent incarnations of the world's oldest living tree a new growth habit; instead of spreading shrub-like, new growth towers.

Toward the end of his life, Linnaeus, also in towering form, wrote a book of moral teachings for his first-born son called *Nemesis Divina*. In it, Linnaeus admonishes: "God seeks revenge on children and grandchildren."²³ Of sinners, he meant, and for twelve generations. If there are four generations for every century, Linnaeus's descendents are due to be lifted of his retribution about now. On the last day of the Linnaeus Tercentenary celebration last December, Martin Nervall, the youngest of Linnaeus's two hundred descendents (none of whom bore or bear their grandfather's surname), defended his dissertation thesis.²⁴ It demonstrates a treatment for malaria caused by the now quinine-resistant parasite, *Plasmodium falciparum*. Its title is: "Binding Free Energy Calculations on Ligand-Receptor Complexes Applied to Malarial Protease Inhibitors."

The world's oldest living tree (WOLT) has not yet been named.

These days we reject superstition in favor of demonstrable wonders. But, it may be argued, we force ourselves against our nature. Show me an enlightened mother who doesn't have absurd thoughts about what hurts and how to protect her child, show me one who doesn't still blame her sins, writ on the invisible template of their

tangled fates, for what stands in his way. Everything spreads. Fairy tales, names, and neuroses are heritable. What would today's doctors have made of Little Botanicus, I sometimes wonder, whose obsession was not only to order and name all of creation, but to open up the beam of scientific inquiry, to demystify all of man's mythical beings? And what would that grown-up boy have made of obsessive, enlightened you? Who ate the swallow's heart? Would he have known you as kin or fixed you like eye color with the light of his goose wing quill: *Homo Paradoxa*?

14. BLOOD

Desperate to know and be known, our species shed hair everywhere that blushes. Some scientists now think color vision evolved not as a strategy to help us find food, but as a means of reading one another.²⁵ We did it first with our cones and later with language: flush of youth, blanch of fear, ghostly pale, sickly green, hot headed, in heat, in the pink of good health, black and blue. Blue: in the face, with exasperation or sadness (not regret). Blue: at birth (but for less than a minute). The color of the code they called.

15. SOME FISHERMAN EMPLOYED

Consider this. Blue eyes like yours and mine aren't really. No pigment colors them that way; there is little if any melanin in the front, or colored part, of their irises. Rather, they look blue for the same reason the sky does: because the particles in them are small enough to scatter short, or blue, wavelength light, and what lies beyond that is light-absorbent black. (In all but albino eyes, the back of the iris is outer-space black.) And they look blue because our eyes have cones in them that allow us to see something like 2.3 million colors, many of which are blue. And because our grandfathers had blue eyes too.

Before I knew you, I called you after my grandfather, whose sins were probably many but mostly unknown to me and whose name I always loved. He was not Swedish, but his first name ended in "son," and about him I remember mostly this:

He was a fisherman. He ate a banana every morning of his life—the forbidden fruit from which Linnaeus coaxed the first European blossoms and, upon biting the peeled finger of *Musa Paradisiaca* L., was not, in fact, cast out of the garden; the flesh on one of his legs

was burned in a helicopter accident and always put me pleasantly in mind of a bird, oven-roasted; he let me brush his curly hair with my doll's pink, hard-bristled hair brush—he called her Sinful Mary, even though her first name was really Cindy; he grew Ruby Red (*Citrus Paradisi*) trees in a grove in southern Texas where in summertime the air roiled with bugs and steam and the fetid odors of what he called *resaca*, or ocean's backwash; he taught me about tides and fishing at night; he taught me how to break open the shell of a crab to get the most of its meat; he taught me how to twirl the honey spoon so as not to spill a drip; he let me eat it by the golden brimming spoonful, each amounting to more than a bee's life-long labors; he ate dessert before dinner; after fishing he rubbed his cut hands with sliced lemons so my grandmother could stand them; he cleaned beach tar from oil spills off the bottom of my feet with gasoline—the second largest oil spill in history happened in the gulf of Mexico when I was a tow-haired five-year-old; he taught me about the endangered Kemp's Ridley sea turtles (*Lepidochelys kempii*) who lay their eggs in the beach sand of the little barrier island where we liked to walk—Heartbreak Turtles, as they are known to the fisherman in whose boats they rock flat-side-up and dying; he almost died alone in a boat in the Laguna Madre when, unhooking the maw of a catfish, he accidentally grazed its poisonous dorsal barb; he hated this kind of fish and whenever he accidentally caught one, would smack it with a board he kept special for that purpose and then leave it to dry on the pier, not even using it for chum in one of his home-made shrimp traps; he suffered from ocular migraines that over-wrote his vision with blinding whiteness; he taught me to trace in my mind's eye the inky tentacles from the puckered blue-purple floats of Portugese Men O'War (*Physalia physalis*, L.) so that they would never sting me; he taught me about the undertow; among his favorite phrases was “whipped by the ugly stick”; he was a user of toothpicks and they stuck like stalactites from the ceiling of his old car; he wanted me to love the ocean and my sister in the reverse order; he loved birds, especially the Great Blue Heron (*Ardea Herodias*, L.); when he died his ashes were put to bed under the salty covers of the Laguna Madre where he often fished; when I was born, he came to the hospital nursery and asked to see me, The Little Butter Covered One; he left me imprinted on mingling lemon and fish scale; in the end, he didn't want my sister or me

to see him; before you, there was never another to carry his name for the simple reason that his mother, who died before I was born, like he did before you, made the name up. Whenever we see a great blue heron, who I believe overwinters in Texas, just like he and my grandmother did, my sister and I pretend it is he, and while my sister's mind branches some other secret, far-flung way, I remember how I fear the death of my loved ones every time one of them goes away, and how they are not missing from the world, only missing from me, irretrievable as early memory, as ashes or birds beneath ice-covered lakes, the lakes in the land, the land in the ocean, the ocean in my heaven.... Beaks gouge hard at the water's icy underside. Unbreathable air from feathers bubbles up.

Here you bring me another labeled drawing (my landlocked son) of some newly named sea creature for me to examine, the pile already threatening to topple.

You told me that every ten days a new deep sea animal is named. You cried in your bed in the dark and, rubbing your eyes hard, said you didn't want to die. You promised me that on Mondays while I still live and you are a grown-up, you will take me and my grandchildren in a submersible under the sea to watch you discover new things. You worried about how you would know if what you had found was already known or not, had already been named or not. The world is enormous and small all at the same time.

If tonight you wake from a bad dream—all the creatures familiar, all the names handed out—will your irises, pulling tight to open the pupils their widest, make a color? Even to the moth that clings to your pale curtain fold, the answer is no; your eyes will blink black as a starless night. Unlike light though, sound rounds corners; your voice will ring out. Its waves will rub me in my bed, shove me all salt and sandy-eyed ashore, and I or your father will come, heavy in sleep's half-torn mantle, trailing dreams like text unraveled.

16. ALL THAT I CAN COMMUNICATE

Since then I have only viewed it as a wild-goose flying by, or a bird of passage, having passed quickly through on a couple of occasions, without stopping. That which I observed in my youth... I now recall as a dream, which is all that I am able to communicate.

—Carl Linnaeus, *Nemesis Divina*, ca. 1750.²⁶

17. BIRDS OF PASSAGE

Hirundo rustica, L., the Barn Swallow, will fly up to 7,000 miles to reach its wintering grounds each autumn. Only a few weeks fledged, baby swallows make the trip with no help from their parents, returning, remarkably, to their birth site in spring. Changes in day length trip hormonal wires that tell the birds when it is time to go. They will be restless for a period beforehand. Like bees, some birds use the position of the sun to navigate, or orient themselves using the directionality, or polarization, of the sun's light.

Scientists believe that migratory birds rely predominantly on the earth's magnetic field. They may have photosensitive pigments in their eyes that can, under certain wavelengths of light (color that is), provide them the information they need to fly toward or away from either of the earth's magnetic poles. These birds may also have tiny magnetic minerals somewhere between their eyes and their brains that are fine tuned to respond to both the intensity and angle of the earth's magnetic field as it varies in space, so that they experience our planet's vast electrical current—brought on by the spin and churn of molten iron at its core—as a shifting breeze on their faces, with a smell, sound, aura, taste, tingle, or some other unknowable sensation in the wing, beak, claw, or feather. They map their flight paths by pinning specific landmarks (say, a good lake for skimming bugs and drinks) to its unique magnetic signature. These semantic memories keep the birds on course in future migrations, and may even help subsequent generations as they, less than a month old, make the journey for the very first time.

It's almost as if these creatures have less circuitry between their double helices and the cells where acquired knowledge is kept. Some of what is learned is passed on through the genes. Some of what is loved is too, even for us—we imprint irreversibly on first faces or flowers or ocean animals, whether those things will love us back or not, whether they will fulfill us or not.

Carl Linnaeus refused to entertain any persuasions about swallows taking seasonal flight, but maintained lifelong that, just as Aristotle first put it, the birds hibernate beneath water. I wonder: On what safe site will superstition tap you? Where will you persist against reason? And what will it save you, and what will it cost?

In heraldry, the martlet is a mythical swallow. It is a legless, un-landing creature, with wings never ceasing, like its heart—your

brain—always beating, and it flies with a prim pointy beak and scissor-cut tail. The martlet stands for young sons who have inherited no lands, who are rootless and restless, who quest endlessly for knowledge. Like the keepers of eyestones, martlets are birds unspoiled by landing. They keep suspended like a bird on a page or a crest, or a torpid bird, or belief itself.

There are words you haven't learned yet that apply to you perfectly. Some I keep like a parent's mistake, like an unsettling dream, misdiagnosis, dark fairy tale, unintended secret—all things you are greedy for: Petrified of Bees, *Homo Paradoxa*, On the Spectrum, Disruptive in Class, Little Oceanus, In These Ways like His Mother. Dear Martlet, may your feet when you find them touch down and not spoil. When at last you still the whirring. Dear Martlet.

ENDNOTES

Creative liberties were taken with the childhood of Carl Linnaeus where it was written in the present tense. Unless common knowledge (which slides readily into lore) or otherwise noted, biographical information was gratefully acquired from Gunnar Tibbell, ed., "Linné on Line," Uppsala University, <http://www.linnaeus.uu.se/online/> (accessed 24 May 2009).

1. Lisbet Koerner, *Linnaeus: Nature and Nation* (Cambridge: Harvard University Press, 2001), 21.
2. Koerner, 22.
3. J. D. Mollon, "Commentary: Color Vision: Opsins and Options," *Proceedings of the National Academy of Science* 96 (1999): 4743–4745, <http://www.pnas.org/content/96/9/4743.full.pdf+html> (accessed 24 May 2009).
4. Hattie Ellis, *Sweetness and Light: The Mysterious History of the Honeybee* (New York: Harmony Books, 2004), 64.
5. Endel Tulving, "Episodic Memory and Autonoesis: Uniquely Human?" in *The Missing Link in Cognition: Origins of Self-Reflective Consciousness*, ed. Herbert S. Terrace and Janet Metcalfe (New York: Oxford University Press, 2005), 3–56, <http://books.google.com/books?id=X6RZZPliRewC&printsec=frontcover&dg=the+missing+link+in+cognition> (accessed 24 May 2009).

6. Karl von Frisch, "Decoding the Language of the Bee" (Nobel Lecture, University of Munich, Federal Republic of Germany, December 12, 1973), http://nobelprize.org/nobel_prizes/medicine/laureates/1973/frisch-lecture.pdf (accessed 24 May 2009).
7. Eliana Coldham et al., "Art, Vision, and the Disordered Eye," Vision and Aging Lab, Department of Psychology, University of Calgary, <http://psych.ucalgary.ca/PACE/VA-Lab/ADVE-website/default.html> (accessed 24 May 2009).
8. *The Houghton Mifflin Dictionary of Biography*, s.v. "Monet, Claude," <http://books.google.com/books?id=FRSe39hYzqMC> (accessed 24 May 2009).
9. Vivian Russell, *Monet's Garden: Through the Seasons at Giverny* (London: Frances Lincoln Ltd, 1995), 19, <http://books.google.com/books?id=xGjdOPdpOGkC> (accessed 24 May 2009).
10. Bruno Laeng et al., "Latitude-of-Birth and Season-of-Birth Effects on Human Color Vision in the Arctic," *Vision Research* 47 (2007): 1595-1607, <http://uit.no/getfile.php?PageId=1935&FileId=705> (accessed 24 May 2009).
11. Eric Schwitzgebel, "Why Did We Think We Dreamed in Black and White?" *Studies in History and Philosophy of Science* 33 (2002): 649-660, <http://www.faculty.ucr.edu/~eschwitz/SchwitzPapers/DreamB&W.pdf> (accessed 24 May 2009).
12. J. D. Mollon, "'Tho' She Kneel'd in that Place Where They Grew...,'" *Journal of Experimental Biology* 146 (1989): 21-38, <http://jeb.biologists.org/cgi/reprint/146/1/21?ijkey=fdbea9cdab482a348e5c86cb889dcac4563d54b8> (accessed 24 May 2009).
13. Koerner, 22.
14. Giuseppe Pitré and Ada Walker Camehl, *The Swallow Book: The Story of the Swallow Told in Legends, Fables, Folk Songs, Proverbs, Omens and Riddles of Many Lands*, trans. Ada Walker Camehl (New York: American Book Company, 1912), http://books.google.com/books?id=aExrMoLDXT8C&dq=the+swallow+book&printsec=frontcover&source=bl&ots=cEQKTVoUWz&sig=xKBACWe7ygHiTMZnUP-83JSe1CU&hl=en&ei=rMYZSvXLOIuQMvjBwJUP&sa=X&oi=book_result&ct=result&resnum=4 (accessed 24 May 2009).
15. Swedish Museum of Natural History, "Carl Linnaeus," <http://www.nrm.se/researchandcollections/botany/phanerogamicbot->

- any/botanicalhistory/carlvonlinne.4.5fdc727f1od795b1c6e80007524.html (accessed 24 May 2009).
16. Peter Collinson to Carl Linnaeus, 15 September 1763, *The Linnaean Correspondence*, <http://linnaeus.c18.net>, letter L3296 (accessed 24 May 2009).
 17. Peter Collinson to Carl Linnaeus, 20 May 1762, *The Linnaean Correspondence*, <http://linnaeus.c18.net>, letter L3070 (accessed 24 May 2009).
 18. Koerner, 20.
 19. Charles Darwin and Francis Darwin, *Charles Darwin: His Life Told in an Autobiographical Chapter, and in a Selected Series of His Published Letters*, 4th ed. (London: John Murray, 1902), 72, <http://books.google.com/books?id=bzt8mrERX6UC&printsec=toc> (accessed 24 May 2009).
 20. Koerner, 19.
 21. Koerner, 180.
 22. Umeå University, "World's Oldest Living Tree—9550 Years Old—Discovered in Sweden," *Science Daily*, April 16, 2008, <http://www.sciencedaily.com/releases/2008/04/080416104320.htm> (accessed 24 May 2009).
 23. Koerner, 160.
 24. Johanna Blomqvist, "Linnaeus Descendent Takes Doctorate on Last Day of Linnaeus Tercentenary," Uppsala University, <http://info.uu.se/press.nsf/pm/linnaeus.descendant.id1D7.html> (accessed 24 May 2009).
 25. California Institute of Technology, "Old-World Primates Evolved Color Vision to Better See Each Other Blush, Study Reveals," Caltech Media Relations, March 2, 2006, http://mr.caltech.edu/press_releases/12802 (accessed 24 May 2009).
 26. Carl von Linné and Michael John Petry, *Nemesis Divina*, trans. and ed. Michael John Petry (New York: Springer, 2001), 60, <http://books.google.com/books?id=QQ8cs4kOBlAC&pg=PP1&dq=nemesis+divina> (accessed 24 May 2009).