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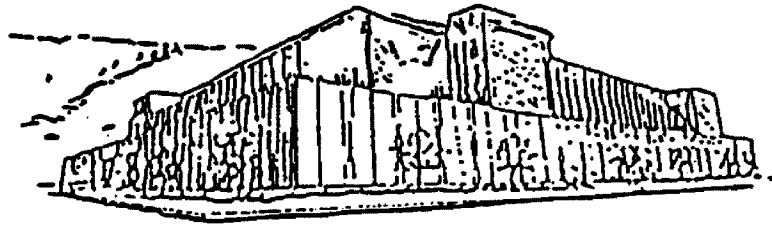
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AN ANTHOLOGY OF VERMIN

by Kim Todd

Yale University, B.A., 1992

The University of Montana, M.F.A., 1998

Presented in partial fulfillment of the requirements

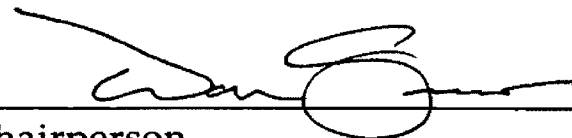
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An Anthology of Vermin (91 pp.)

Director: Don Snow



As Europeans began settling the area which would later become the United States, they brought animals with them for a variety of reasons from food and fur to sport hunting. The essays contained in this thesis examine five specific introductions and one that almost happened but didn't. The Virginia Company in London sent a hive of bees to its colonists in Virginia, perhaps to provide honey and wax, not knowing that the bees would spread and provide the more important function of crop pollination. The sea lamprey slipped into the Great Lakes as both Canadians and Americans rushed to build canals to connect the interior waters to the ocean. Charles Valentine Riley of the United States Department of Agriculture sent one of his employees to Australia to bring back predators of the cottony cushion scale that was chewing through California citrus crops, and the vendalia beetle was introduced as a result. Missionary Sheldon Jackson brought domesticated reindeer from Siberia to Alaska to feed and civilize the Eskimo by turning them from hunters to herders. E.A. McIlhenny imported nutria from South America to his estate in Louisiana, possibly to breed for fur. Finally, one midwestern cattleman toyed with the idea of bringing kangaroo to fill the plains now that the bison were gone. Pinpointing the moments, reasons, and desires behind these exotic species introductions may provide insight into human relationships with exotic species of animals throughout history and offer a glimpse of the ways in which Americans have sought to define and create their country biologically as well as culturally and politically.

Table of Contents

Introduction.....	1
The Land of Milk and Honey.....	7
An Artificial Wedding.....	21
The Bug Hunters.....	31
Mission to the North.....	46
Swamp Riches.....	62
Bonus Round: Kangaroo on the Plains.....	78
End Notes.....	83
Bibliography.....	87

Introduction

Hidden Villa Summer Camp, tucked in the Santa Cruz Mountains of Northern California, was an 11-year-old's dream. We tended and ate meals out of a vast vegetable garden, and, as a result, every course contained zucchini. The arts and crafts barn churned out a steady stream of lanyards and polished wood medallions. Some evenings, we'd sleep outside on our cots and drift off looking up at branches overhead, trying to unravel the dark net of limbs and needles. On alternate nights, we'd venture in the woods for overnights and sleep entirely zipped up in our sleeping bags, every last strand of hair inside, because of that girl who walked into the dining hall wearing a tick the size of a nickel. I loved it.

That is, with the exception of Tanya, the daughter of my parent's friends. She was blond, had an English accent because she'd spent a summer

there, was a year older than me, and was just unspeakably horrible in every way. Once or twice a year when our parents got together for a pot-luck, we'd torture each other under the guise of playing and build up resentments to last the next six months. At camp, though, with no family members watching, we chose our own acquaintances and went our separate ways, relishing the freedom and independence.

But outside the little haven of live oak, larger forces were at work. In gardens and orchards, the Mediterranean fruit fly was staging another appearance. This hungry insect with striped wings, makes a hole and deposits its eggs in the pulp of figs, dates, olives, and apricots, among other fruit. The larva eat the flesh and the fruit drops from the tree, causing crop failure and farmer despair. The problem was supposed to be solved by the start of summer, but populations surged in Santa Clara and Santa Cruz counties after a release of thousands of sterile male flies that turned out to be fertile enough.

This little fly could make bureaucrats tremble. They buried 750 tons of infested fruit in a landfill like toxic waste. President Reagan threatened to quarantine the whole state. Governor Jerry Brown, who hesitated to spray at first, watched his approval ratings plummet and suddenly re-election seemed to hinge on those jaunty banded wings. As a result, state officials planned to helicopter spray the whole Santa Cruz Valley with the insecticide Malathion. Some area residents left for the few days of the spraying, others just covered their cars, while our counselors realized that campers sleeping out under the maze of tree branches as the helicopters circled overhead wasn't such a good idea. So Hidden Villa was evacuated.

Newspaper photographers made us roll up our sleeping bags for the cameras, and then asked us to reroll them in better light. Television crews

filmed us standing in a circle by the dining hall and singing "Let it Be" while parents lurked around the edges, dusty station wagons running, to take us home. But my parents made plans while I was away at camp and told me to stay with Tanya for a few days in San Jose until they could come fetch me and bring me back to Berkeley.

To be wrenched from feeding horses and skinny dipping to stay with Tanya's parents, who, if possible, I disliked more than Tanya herself, seemed too much to bear. On top of it all, my first night there my mother called with bad news. Our neighbor, a 90-year-old who used to feed me sourballs and tell me about her childhood homesteading not far from Laura Ingalls, died while I was away. She had given me a peach to take to camp, and after I hung up, I found it still packed in my duffel bag, uneaten. Tanya accused me of faking my tears to get sympathy, and, in truth, they were composed of as much frustration as grief. I remember it as one of the high points of misery of my childhood and spent most of the rest of my stay at Tanya's writing poems to commemorate that fact.

I had been writing about the history and effects of introductions of exotic species into the United States for three years before I realized how entwined that memory was with an invasive plants and animals. My whole childhood, in fact, was interwoven with the constant threat of non-native organisms: the careful ritual of washing pears and apples sprayed with insecticides concocted to kill exotic insects, the stops at quarantine checkpoints to declare our fruit after traveling out of state, and the nervous searching for the rebel orange bought in Oregon or Idaho that had rolled under the front seat of the Ford. California was and still is a paradise constantly under attack, invaders rattling the gates. Last summer six Mediterranean fruit flies that

showed up in southern California triggered a release of 5 million of their sterile brethren to search and destroy.

This tenuous balance and the need for constant vigilance is an indelible part of the mold of The Golden State. The Medfly invasion, the mid-season shut down of Hidden Villa, the trauma at Tanya's, all these were the fallout of a battle going on since the first miner rested his gold pan on the streambank and noticed that the soil it sat on looked fertile.

On a larger scale, leaving California and my childhood behind, the history of the introduction of exotic species to the United States blends with the history of the nation. As the United States built itself politically and culturally, it built itself biologically as well, adopting many species from England, a few from South America, a handful from China, a smattering from Australia. Each is a souvenir of a vision the country had of itself. While many releases seem like the product of one individual's warped will, even the flukiest introductions tend to have roots in the culture of the time. Surprisingly enough, missionary and General Agent for Education Sheldon Jackson was not the first to propose feeding the Alaskan Eskimo with reindeer imported from Siberia, and many tried to introduce ring-necked pheasants to the United States before Judge O.N. Denny succeeded. Nutria farms, quickly abandoned, dotted the country in the 1930s.

Even if they were not deliberately introduced, even if there is no way to pinpoint the why and the how of a release, many of the species that haunt us are unavoidable byproducts of the way we've chosen to live. You can't have crops as we do in California, rows to the horizon of perfect exotic apricots and avocados, without having the exotic pests that live off them. Hessian flies, for example, a much bemoaned exotic wheat pest, live everywhere there is

wheat. Everywhere.

This influx of new species hasn't been easy on the environment. Native species are being overrun by exotic competitors that thrive on the disturbance that humans create and multiply in the absence of native predators. Biodiversity suffers as a few very successful plants and animals storm into habitat that originally supported many. On a simply human scale, knapweed makes rangeland useless, sea lamprey bankrupt Great Lakes anglers, and zebra mussels clog water pipes.

As a result of our simultaneous dependence and discomfort, arriving at a clean position regarding exotic species can be difficult. It's easy enough to snicker at 19th-century and even contemporary views that blithely describe some animals as good and others as bad, consigning a whole sweep of species to the very unbiological category of "pests" or, in the case of plants, "weeds." But how do we decide what we want and what we don't without being as shortsighted or arbitrary as those who came before? One line that is attractive because of its clarity and simplicity is that exotics are unwelcome and we should cultivate and appreciate native species. But as most of our crop species and domestic animals are exotic, this would entail a vast restructuring of the way we feed ourselves. And if we allow that domestic plant and animal species can be non-native, but wild animals and plants should be native, the line is no more clear. Animals and plants do not live in isolation, and though one or two elements of an ecosystem may be under our control, the whole never is. Exotic crop plants bring exotic insects, which live a wild existence and force the question of whether we want to employ biological control and introduce more exotic insects to prey on those already here, or douse our foods with poison.

Representative Greg Laughlin of Texas may have summed up the confusion most succinctly. In 1993, as the Office of Technology Assessment presented its report on the introduction of harmful non-indigenous species to the U.S. he asked, "What you are telling us is that there are some bad critters which we know in South Texas as the Fire Ant, the Boll Weevil, killer bees, probably even nutria which was introduced for good cause and has created interest. Then you come along and tell us there really are some wonderful things that are non-indigenous. How do we in this Committee determine what is good or what is bad? Do you have a procedure?"¹

Ultimately, I'm not sure that these stories offer any solutions. They certainly don't offer any simple ones. But they are worth telling anyway. My hope is that by understanding these decisions, by feeling for the logic and desires that fed them, we can better comprehend our relationship to the landscape that we create and recreate constantly, even in our dreams.

The Land of Milk and Honey

The swarm was cast.

The bees took flight, buzzing, clustering, terrifying to see. They ate well, gorged on honey, in preparation for the exodus. Wax glands were filled, ready to begin construction. The queen dragged her swollen abdomen from the old hive to this bare and promising branch where the swarm hung like a fruit, waiting for the sign. Meanwhile, the scout bees went exploring. They took off from the mass and flew a zig-zag pattern, back and forth, pacing all the hollow trees they found, reporting the quality and location of their finds by dancing on the surface of the cluster. They investigated and cross-checked other scouts' leads until they reached consensus, all dancing the same dance, and gave the signal for the swarm of 30,000 to move into its new home. The afternoon was warm and sunny, spring of 1622, the kind of day these heat-

loving insects most often choose for travel. While North American's native bees went about their business of gathering pollen, the first colony of domestic honey bees to reach Virginia, to reach the New World, had split in two.

If a Jamestown colonist had looked up at the gray cloud of the swarm gathered like fury, he might have interpreted it as an evil omen. Or smiled at it as a divine gift and anticipated honey the coming winter. Or he might have shrunk in disgust from these insects reputed to breed from the dead. What the legends didn't say, as this battered colony of England teetered on the verge of failure, was that in the pollen baskets on the back of their legs, the bees carried the grains of success.

* * * *

Back in London, four months earlier, in late 1621, the stockholders of the Virginia Company grew impatient. Hadn't they bled money as if from a knife in the side for more than ten years now? Yet with every letter came more complaints. Please send more food and fewer people, the colonists wrote. We don't have time to plant and harvest enough for a surplus, and more hungry settlers keep arriving without provisions to last a month. They enclosed long lists of items each settler should bring: two bushels of peas, two bushels of oatmeal, a suit of light armor, three pairs of Irish stockings, a kettle, a grindstone, a gun. The investors replied by urging the colonists to work harder. Where are our profits? they asked. Where are the silk and wine and iron, the fruit of our seed money? We are sending one hundred more colonists to speed up production. The letters dashed back and forth, as fast as

the ships could carry them, penned in tones of polite outrage.

In late November and early December, the Virginia Company sent the *Bona Nova*, the *Hopewell*, and the fur trader the *Discovery* to Jamestown. Over the course of four months, the ships traveled between the fantasy of the adventurers and the reality of the suffering colonists: a distance so vast that the actual mileage seemed small in comparison.

The colonists' disillusionment and the Virginia Company's expectations were fed by report after report from explorers who described the New World as a paradise. In 1609, a Virginia Company ship called the *Sea Adventure* disappeared on its way to Jamestown. Sir George Somers and one hundred fifty others were given up for dead until a year later, when two boats came to shore bearing crew members and passengers who had lived on the Bermuda Islands for a year. From their tales of the easy life and plentiful food on the islands, Captain John Smith commented on "what a paradise this [was] to inhabit."¹ Indeed, these accounts of the Bermudas may have inspired Shakespeare to write the *The Tempest* in 1611. In his version, the island featured airy sprites, young lovers, goddesses conjured out of the air, and nectar-sucking bees.

Virginia, too, was painted with impossibly glowing colors. In a report on the state of the Virginia colony, Edward Waterhouse declared it "a Country which nothing but ignoarance can thinke ill of, and which no man but of a corrupt minde & ill purpose can defame.... It paralelleth the most opulent and rich Kingdomes of the world."² He also added that cows grew bigger in Virginia, that horses became more beautiful and courageous, and that deer were so fertile as to give birth to three fawns at a time. Smith, who didn't shy from relating the difficulties and death many colonists found in

Virginia when he wasn't busy spreading tales of his own heroism and rescue by Pocahontas, was also swept up by its possibilities: "These waters wash from the rocks such glistening tinctures that the ground in some places seemeth as gilded, where both the rocks and earth are so splendid to behold, that better judgements than ours might have been perswaded, they contained more then probabilities."³ Another visitor described "the purling Springs and wanton Rivers everywhere kissing the happy soyle into a perpetuall verture, into an unwearied fertility."⁴

While these visions sparkled before the eyes of the stockholders, colonist Peter Arondelle wrote a letter to Edwin Sandys in the hopes of gaining some relief from the grim reality lurking behind them. In a letter dated December 15, 1621, just after the ships left England, he wrote: "these few private lines shall only serve to intreate your favorable voyce vnto the Company, for the pformance of their promises. And because I am neerer to me than any other, and that Charitie begins wth ones self, I crave ptticularly for me and my poore familie. whereas Mr Deputie Ferrers promised me the assistance of Captaine Nuse and my Sonne in lawe Captaine Mansell (who is dead) for fishing and hunting, and provision for a whole yeare before hande, a house ready builte, and Cattell: wch proved farre defectyve. For, for provision all the wee now have is but a pinte and a halfe of musty meale for a man a day."⁵

But relief would be a long time coming. Malaria continued to rise out of the swamps and claim new arrivals. Eager for a crop with value in English currency, the colonists planted tobacco rather than corn, forcing Jamestown to rely on trade rather than self-sufficiency. Every year brought threats of starvation, and the colonists had to cajole and threaten the Powhatan Indians

to provide them with supplies. Houses proved so scarce that one visitor reported that newcomers had to seek shelter under bushes. And tensions with the Native Americans were building.

Early on the morning of March 22, 1622, four months after the Virginia Company and Arondelle sent their letters and a few weeks before the boats would reach Jamestown, the Powhatans attacked the colonists. Though the settlers thought relations were friendly, the tribes felt differently. Maybe they had grown concerned as more and more settlers had come in with each boat, wanting land, demanding corn. At breakfast, in the fields, indoors and out, they picked up the settlers' weapons and cut them down, taking advantage of the fact that the colonists had moved out from beyond the original central town. The slaughter astonished the colonists, who could not see how the natives would ignore their offers of Christianity and their restraint in not claiming their prime fields.

As the survivors tallied their losses, the establishment of Jamestown seemed all the more precarious. The men sent to work iron, all killed. Houses burned. Small starts of vineyards torn by the roots. They vowed revenge and determined to subjugate the natives in whatever way they could, but wondered if they had the means. By the end of 1621, the Virginia Company had sent over 4,270 colonists. Just before the massacre, 1,240 remained; in its wake, there were a mere 893 settlers left.⁶ To make this a paradise--the land of milk and honey--they had a lot of work to do.

* * * *

A few weeks later, in mid-April, as the colonists were still sorting

through the rubble of their homes to find usable scraps, the *Discovery*, the *Bona Nova*, and the *Hopewell* sailed into port. As the remaining residents unloaded the ships, the Governor and Council in Virginia received a letter from the Company in London that urged increased productivity and listed the contents of the holds: "We have by this Shipp and the Discoverie sent you divrs sorts of seeds, and fruit trees, and also pigeons, connies, peacocks maistives and beehives.... We have sent unto you likewise some vine cuttings and a very smale quantite of silkworm seed."⁷ They also sent twenty new colonists in the *Discovery*, twenty in the *Hopewell*, and fifty in the *Bona Nova*.⁸

Most items of cargo on the ship had clear and well-described functions. King James I harbored great hopes of using the colony to break England's dependence on imported silk, and he personally contributed several batches of "silkworm seed" (cocoons) to the effort. The Virginia Company instructed the governor that no colonists except for council members and heads of plantations would be allowed to wear silk unless they produced it on Virginia soil. Wine, too, held promise. Explorers discovered grapes growing wild in the New World, and wine makers were imported along with vine cuttings from France. Pigeons and rabbits (coneyes) made tasty meals. But why were the bees on board?

The reasons are as murky as the surviving records. Though beekeeping and farming are now often separate pursuits, farmers of the 1600's viewed bees as an essential part of agriculture. In 1623, one year after the first honeybees arrived on Virginian soil, Gervase Markham wrote *Farewell to Husbandry*, a how-to book for tilling the land. Among the many tasks that a farmer was supposed to accomplish during the month of April was to

“open...hives and give Bees free liberty, leave to succour them with food, and let them labour for their living.”⁹ While farmers valued bees because they offered honey to sweeten and preserve food and wax to make candles, they also saw them as a way to make money through trade. According to E.W. Gent in “Virginia: More especially the South part of, Richly and Truly Valued,” both honey and wax made the list of Virginia exports in the 1620’s.¹⁰ Mid-century, a planter named George Pelton earned thirty pounds a year off his hives, and potential stretched far beyond this sum. The author of “A New Description of Virginia” reported that “if men would endeavor to increase this kind of creature, there would be here in a short time abundance of Wax and Honey, for there is all over the country delicate food for Bees.”¹¹

But the interest in honeybees, or *Apis mellifera*, was more than economic. The same mixture of science and fantasy that allowed explorers to categorize the natural resources of Virginia with a practical eye, while partially believing they stood at the doorstep of Eden, allowed them to look at animals simultaneously through the lenses of money, morality, and magic. In some ways, the organization, hygiene, division of labor, and selflessness of honeybees all seemed like an example for humans. Some writers even considered these six-legged workers and drones better citizens than men, who could be disorganized, dirty, chaotic, and selfish. Naturalists looked to Pliny as their greatest authority. He had lauded the bee: “Nature is so great that from a tiny, ghost-like creature she has made something incomparable. What sinews or muscles can we compare with the enormous efficiency and industry shown by bees? What men, in heaven's name, can we set alongside these insects which are superior to men when it comes to reasoning?”¹² Virgil, coming back in vogue in the seventeenth century, had devoted the fourth

section of his agricultural poem, *The Georgics*, to bees, crediting them with all kinds of virtues: "I'll tell of a tiny/Republic that makes a show well worth your admiration--/Great-hearted leaders, a whole nation whose work is planned."¹³ And Montaigne, not long before the Virginia Company staked its claim, had praised the honeybees for their attacks on other bees and for their use in human combat. He cited battles in which one side would fling bees at the other to rout opposing forces: "[Bees] will have the power and courage to scatter an army."¹⁴ And the product of all this tidiness, organization and aggression? Honey, sweet gold. Enough to make the hard months of winter easy. Enough, in the right dose at the right time, to turn a worker into a queen.

It's difficult to reach back and grasp what type of world the adventurers and colonists lived in, so different from our own. While observing the natural environment and imbuing it with moral qualities, they based their knowledge on scholarly reports rather than the direct observation we consider vital to science today. At the seashore, a special breed of geese grew perfectly formed in the center of barnacles. In the sky, eagles carried cool stones to their nests to ease their labor pangs. Deep in the forests, unicorns paced, always just out of sight, while trees dropped leaves which turned to swallows before they hit the ground. Underground, ants foretold the future, and male and female diamonds mated to produce glittering offspring. The scraps of information that travelers and scientists gathered provided only fragments of the entire picture, and imagination rushed in to patch the holes.

The Jamestown colonists lived in a time perched on the edge of scientific breakthroughs about insects along with other facets of biology. In 1625, Francesco Stelluti peered at bees through a microscope, only newly in

use. The fragmented eyes, the delicate veining of the wings, the hooked end of each foot: all came into clear focus for the first time. Stelluti recorded his observations in an engraving, with particular attention to the insect's long tongue. In 1669, Swammerdam offered more accurate observations of bees than anyone to that time in his book *The General History of Insects* and suggested that spontaneous generation was a myth. By the end of the century, Francesco Redi had established it without a doubt. Employing a strict regimen of observation and experiment, Redi rewrote the natural history books. Did swallows generate from leaves? No. Did fish in China sprout feathers in the summer? Probably not. Did birds use magic stones to restore eyesight in their young? Definitely not. These revelations were right around the corner, but in 1622, ideas about the lives of insects were as fantasy-fueled as ideas about the New World.

One particular field that was about to burst into bloom with the help of the scientific method was the study of pollination. While botanists and gardeners knew that pollen affected plants' ability to bear fruit, they didn't understand the insect's role. One hundred years after the first hive arrived in Jamestown, scientist Philip Miller was observing his tulips. He had plucked the stamens out of all the flowers in one patch to see if the tulips would reproduce. As he watched, bees covered with what appeared to be dust flew from a plot of intact tulips to the ones without stamens, visited the blossoms, and left some of the powder behind when they buzzed away. Several years later, Arthur Dobbs wrote in his *Philosophical Transactions* of 1750, "Now if the facts are so, and my observations true, I think that Providence has appointed the Bee to be very instrumental in promoting the increase of vegetables."¹⁵ The New World colonies would soon prove it. Whatever the

Virginia Company thought of honeybees when they loaded them on the ships, the colonists weren't aware of the full extent of the gift.

In the years following the massacre, the Virginia Company faltered. By 1624, inability to turn a profit caused investors to waver in their commitment. A royal investigation shut the company down and returned power to the king. But the honeybees remained a lasting legacy, traveling as far north as they could bear the cold, pushing on to the south and west. Colonists tended some hives, extracting the honey-filled combs to sweeten their meals. Other bee populations turned feral and built their networks of combs in hollow trees. As their numbers grew in the years that followed, they continued to split the hives, swarm, and establish new colonies, keeping pace with the settlers. In his "Notes on the State of Virginia," Thomas Jefferson reported that the Native Americans observed the bees hovering constantly around the settlers and dubbed them "the white man's fly."¹⁶ As the colonists sought to remake the land they found in a European image, fenced and divided into fields planted with exotic vegetables, fruit, and grain, the bees were a great help. Many of the crops relied on insect pollination, and with the multiplying honeybees, bearing pollen from plant to plant, the harvest grew.

Each spring, the honeybees gathered nectar to cure into honey and pollen to pack into bee bread, traveling from blossom to blossom.¹⁷ And when, as often happened, grains of pollen caught on their fuzzy heads and bodies and brushed against the stigmas of each plant, pollen tubes crept down the stiles. The ovaries began to swell. Peaches, apples, oranges, and avocados and other plants benefiting from bees grew and sweetened, developing seeds, turning to juice, pushing against their tight skins, changing from cells of ovule and pollen to heavy fruit, fragrant and ripe. In the honeybees wake,

pears, cucumbers and watermelon bloomed and bloomed and bloomed.

Watching their familiar trees, vines, and shrubs take root in foreign soil and convert this wild landscape to one that looked almost like England, the settlers must have thought it all a bit like magic. A bit like paradise.

* * * *

Here at Jamestown in 1998, mid-afternoon light pours down through the trees. Jet skis and motorboats race up and down the James River, while a ferry makes its persistent way upstream. A flock of seagulls swoops behind, cawing for scraps. The sun glints off the water, making tourists rue sunglasses left in the car.

At the site of the old settlement, history is commemorated in all the usual ways. Captain John Smith, on a high pedestal, looks out over the river, one hand clasping a Bible, the other resting on his sword. Pocahontas hides behind the church and an old man poses for a photograph holding her hand. Stacks of brick mark foundations of old houses, and recorded messages try to breathe life into the ruins. Near the Smith statue, yellow posts of an archeological dig indicate the borders of the original fort, part of which extends now into the river. A man in an Elizabethan costume, complete with plume and white doublet, tells the crowd stories about the rowdy old days. Glass cases in the visitor's center hold a model ship, a brooch, a coin. Walking through Jamestown today is more like peering into a mirror of our present culture than glimpsing a window to the past. On this bright afternoon, it's hard to imagine Peter Arondelle eating his musty meale and writing his desperate letter back to England.

But on a smaller scale, a different history unfolds. A yellow butterfly lifts from the graveyard onto the black metal fence. A small white spider casts billows of silk into the wind. And while the earth of the settlement is hard and dry, supporting lawns and benches, it quickly drops into marsh not far inland. A bridge to the parking lot spans black mud and cattails, shreds of the earlier story. Near the toll booth, a honeybee extracts nectar from a pink blossom. But the question is now, not why was it brought here, but why, in this heat, with these flowers, is there only one?

In the wake of the honeybees' success, other introductions followed. In 1853, Christopher Sheldon brought a hive's worth to California. Italian, Carniolian, and Caucasian varieties of honeybee appeared in 1859, 1883, and 1905, respectively. In the 1950's, fierce Africanized honeybees were brought to Brazil and have since spread northward into the southwest United States, worrying some beekeepers as they interbreed with the more docile European variety. By the 1980's, the imported insects were pollinating four-fifths of the commercial crops in the United States, performing services worth millions of dollars to farmers.¹⁸

But recently, the easy interdependence of food plants and honeybees has shown its dark side. As long as observers have watched bees work in their hives, they have also watched the hives collapse from disease. Foul brood, chalkbrood, sacbrood, acute bee paralysis, and cloudy wing virus can all invade a colony and silence its buzzing. In the past decade, two of honeybees' old enemies have caught up with them in the New World. Tracheal mites live their whole lifecycles in the breathing apparatus of honeybees, weakening their hosts as they clog their airways and suck their blood, and the varroa mite, appearing ten years ago, has wiped out most of the feral bee

colonies and killed off many commercial hives. These mites make their way into uncapped cells and breed in the honeybee larvae. The adult bees crawl out, often crippled and diseased, while a new generation of mites disperses into the broodnest. Together these two parasites have wiped out most of the feral honeybee colonies in the United States and are putting pressure on domestic hives as well.

While some beekeepers are developing remedies and mite-resistant strains, others are turning their eyes to the native bees that remain--over 3,500 species in North America.¹⁹ Native bees, some dependent on specific wild plants, others living in the soil or in dead trees, have declined as honeybees have taken over and agriculture has swept through meadows and forests. Some soil dwellers have died off as farmers have plowed under their larvae. Those making chambers in dead wood have disappeared as forests have been cleared to make room for crops. Pesticides have killed others. Most native bees are solitary creatures rather than living in hives like honeybees, and as a result they have found it hard to compete with *Apis mellifera*, which can locate a good patch of nectar and pollen and call 1,000 others of its species to help pick it clean. The native pollinators have struggled. But rushing in to take their place have been honeybees, thriving on disturbance, living easily next to humans, working well with agricultural plants, mining the flowers at a rate the natives couldn't match.

But with honeybee colonies suffering, scientists and beekeepers are turning their energies to rebuilding native bee populations, and perhaps more challenging, training them to work with people. And they are seeing things that may be as eye-opening as Stelluti's first sight of a bee foot under a microscope: mustached mud bees making their homes in clay walls,

turquoise-banded alkali bees laying eggs in the dirt, carpenter bees digging chambers into wood and constructing sawdust rooms for their offspring, and sweat bees licking sweat gathering behind ears and on the inside of knees. Digger bees, orchard mason bees, leafcutter bees, plasterer bees, and shaggy fuzz foot bees move from flower to flower, along with many others. Some are more efficient pollinators than honeybees, if given the chance.

Whether the mites will really wipe out the honeybees and whether native pollinators will be capable of taking their place remains to be seen. Without doubt, however, the threat of the honeybee's disappearance has exposed our dependence on an insect that aided all our efforts from the moment the first scout flew out to evaluate the Virginia woods. Pollination by insects that evolved in North America, though more ecologically justifiable than reliance on non-natives, will be no easy task. One scientist taught blue orchard bees to live in holes he drilled for them, but it took ten years. As beekeepers struggle to domesticate native pollinators and honeybee populations continue to falter, the true value of the cargo carried on the *Discovery*, the *Bona Nova*, and the *Hopewell* only now becomes clear.

An Artificial Wedding

The trip back up the Erie Canal was quiet in comparison to the dizzy energy of the days before. The downstream float of the *Seneca Chief* marked the opening of the completed canal on October 25, 1825, and the state was wound up with pride. New York Governor DeWitt Clinton rode on the barge, making speeches, gathering praise. Flower garlands arced over the water. Barges including *Noah's Ark*, stocked with western animals from insects to bear, joined the procession from Buffalo to the ocean. Now, two weeks later, fading echoes of cheers, gun salutes, and the pop and sizzle of fireworks made the mornings only seem more hushed. Sore toes and arches reminded some of a long night at the Grand Canal Ball. Others savored the remembered smell of Canal Beef, cuts of fat inland steer, carried to the Atlantic Coast by barge. One or two recollected the sight of a maple sugar canal boat that floated on lake water -- the centerpiece at one of the parties by the shore. The climax

of the cruise downstream had been “The Wedding of the Waters,” when Clinton poured two barrels of water from Lake Erie into the Atlantic. The barrel of sea water they took back to mingle with the Great Lakes was, like the voyage up canal itself, an afterthought.

But they dutifully dumped the Atlantic fluid into Lake Erie from the cask marked “Neptune’s Return to Pan.” As the drops merged into the body of the lake, releasing microscopic creatures and salt, the weary passengers unknowingly witnessed a symbol with even more resonance than the explosion of the 32-pound cannon ball that launched them on their journey.

A few miles away on the other side of the Niagara River, the Canadians absorbed the reverberations. They were building a canal too, and knew the importance of their neighbors having completed a connection to the sea. At the end of 1825, as the party for the opening of the Erie Canal sputtered to an end and the business of hauling goods from inland to ocean began in earnest, the Canadians had plans and surveys and opinions of engineers. They had a government-approved private company interested in building the canal, the Welland Canal Company, and they had an opening ceremony as the first shovel-full of dirt was removed from the spot where the canal would be. And that was about all.

Both countries were seeking to dig their way around a problem, and the problem’s heart was stubborn geography. Lake Erie and Lake Ontario nestle just next to each other, almost touching, like two slugs about to kiss. To the north and east, Lake Ontario drains into the Atlantic Ocean through the slow vein of the St. Lawrence River. To the south and west, Lake Erie touches the fan of the other Great Lakes: Huron, Michigan, and Superior. Water from Lake Erie races down to Lake Ontario through the Niagara River, which also

serves to divide the United States from Canada: Buffalo, New York, on one side, Fort Erie, Ontario, on the other. This should be the final link in a liquid chain connecting the Midwest and the sea, but there is one small obstacle.

Niagara Falls' ability to inspire awe and terror made it one of the first scenic spectacles in the United States. Honeymooning couples would come stare at the torrent leaping over the almost 200-foot drop and hear in its roar an echo of their own passion. Thomas Moore saw God in the crash and flow. He wrote to his mother about the Falls: "I felt as if approaching the very residence of the deity; the tears started in my eyes."¹ Charles Dickens found peace with a capitol "P," and wrote: "Niagara was at once stamped on my heart, an Image of Beauty; to remain there, changeless and indelible, until its pulse ceased to beat, forever." Other on-lookers discovered in the tumbling droplets a lesson in the power of Nature, evidence of geologic time, and, even in the early 1800s, a tourist trap. The Falls were many things to many people. One of the things they were was in the way.

At stake was the grain and meat and metal of the inland portions of the United States and Canada. Both New York City and Montreal envisioned themselves as the dominant trading center in the East, and a canal would only boost their claims. Before the railroads crisscrossed the country, water was the most important method of transport. With a waterway, goods would practically float themselves to market, while without one, the same trip took weeks of dragging over bad roads with tired animals, an expensive and back-breaking proposition. If business people could take goods from Lake Erie to Lake Ontario, they could sell them all along the east coast. But the two lakes were separated by a change in elevation of over 300 feet, much of which occurred in the steep drop of those pesky falls, shooting off spray and

rainbows and romance. No boat could pass over them, and neither could any goods, so farmers and middlemen were left carting their loads between the lakes over miles of uneven terrain. Something had to be done.

New York State's strategy was to carve a trough from Lake Erie to Troy, where boats could then ride the Hudson River down to the Atlantic. This was a longer route than just bypassing the Falls, but it kept goods in American territory. All Canada had to do to establish a trade route in its territory was cut through the small Peninsula and get around the Falls. This plan was best summed up by Sebastian Nauban, a traveler who had similar notion in 1699. While his contemporaries stared awestruck at the torrent of water, he declared "Niagara Falls...is tremendously high, but there is nothing which cannot be corrected by man."³

One of those watching the American's canal fervor most closely was a failed shopkeeper named William Hamilton Merritt. His mill on Twelve-Mile Creek, a slender body of water which fed into Lake Ontario, didn't always receive enough water to run. And he needed it to quite badly. In the prosperity after the War of 1812, he'd launched several business ventures, and within a few years the prosperity faded and he was bankrupt. If he could somehow connect Twelve-Mile Creek to the Welland River, the water would flow by and his mill would run as much as he needed. Since the Welland River connected to the Niagara River above the waterfalls, his plan would, incidentally, provide an important national service. Merritt, eager to get his project get underway, noted for his energy, enthusiasm, and missing sense of humor, had no qualms about linking his personal needs to patriotism. In speeches about the Great Lakes and the access a canal would offer, he was soon declaring, "These seas [afford] the most beautiful and commodious

means of internal communication even seen....It is truly a national object."⁴

With the help of influential friends, Merritt put together the Welland Canal Company, and got permission from the government to gather funds. He surveyed a route and hired work crews. He borrowed money and his men started to dig. The walls of the deepest cut in the canal collapsed, as digging revealed their sand foundations, and his engineers revised their recommendations. They ran out of money, and went looking for more. They built dams from branches and locks from wood. (The lock is the solution to the problem posed by a waterfall. As the water between the lock's two gates is raised or lowered, boats move up or down as if borne by a cableless elevator. They gently rise and sink with mechanized grace, rather than the plunge and tumble of unfettered water dragged by gravity.) Year by year and mile by mile, the project snaked forward. Ultimately, Merritt seems to have been caught in his own trap. Hoping to get the country to support his personal interests, he ended up sinking his personal interest in the service of his country.

By 1829, the canal's first incarnation was complete. A sprawling "Y" with its base on Port Dalhousie on Lake Ontario, one arm reached into the Welland River and from there to the upper Niagara, and the other extended to the Grand River for a short jaunt before touching Lake Erie. With 40 locks, it was 27 miles long, 8 feet deep and far over budget. On November 27, Merritt traveled the newly opened canal from its mouth on Lake Ontario to Buffalo. The boats were swathed in bunting, but they made slow progress through ice and logs and even ran aground. It was no Erie Canal celebration -- there were no flower garlands or maple sugar model boats -- but ships could pass and water flowed through Merritt's mill. In referring to the trip, Merritt recalled the American's festivities and their barrels of water, noting that with the

finished Welland Canal, “The artificial wedding of the Great Lakes of the west and north with the waters of the Ontario, and eventually with the St. Lawrence and the ocean, was complete.”⁵

And despite the headaches of planning and funding, it must have seemed like a miracle, all that water could do. Thousands of pounds of grain and ships broad and awkward slipped right through. Witnesses must have felt lighter themselves watching the push of the current, as if just that moment they’d put down the goods that had to be carried from place to place. Now that the ditch was dug, they just needed to stand back and let the canal flow. This wasn’t the sparkling, sublime water of Niagara Falls—it was the hard-working grease of industry. And the water rushed on, carrying all that floated over it, and all that lived in it.

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The sea lamprey is hard to like. Rings of needle-sharp teeth form the O of a mouth. The rest is all dark undulations, the body-type that slips snakes and worms into so many nightmares: a streamlined feeding tube. When the lamprey scents or sees its prey, it fastens its mouth to the skin, and then slides over the body until it finds the spot it wants to enter. With a raspy tongue, it begins to scrape away the flesh, creating a vacuum in its mouth to suck down the blood, tissue, and eventually bones and internal organs. Secretions from glands in the lamprey’s mouth prevent the fish’s blood from coagulating and keep the food supply liquid. Some have speculated that since the prey of lamprey often die, it is less of a parasite than a predator. Just a very slow one.

The life stages of the sea lamprey are similar to those of a more

charismatic species -- the salmon. While many kinds of lamprey travel from river beds to the sea, the sea lamprey that frequents Lake Ontario is landlocked, so it migrates from river to lake and back again. In late spring and early summer, when the water temperature is right, mature lamprey begin to fight their way upstream. Traveling at night, they make 1-2 miles a day. When they find a good spot--chunky gravel with a bit of sand, water not too deep or too shallow--they dig out a nest. Sand and rocks form a downstream heap, reversing the flow of the current over the nest. As they tire fighting upstream, they suck onto a rock or fallen branch with their mouths until they are ready to travel again. This mode of navigation prompted their Latin name, *Petromyzon marinus*, the first part of which means "stone sucker."

Ancient creatures, lamprey developed from jawless fishes that swam through prehistoric waters 500 million years ago, as evolution strung its first few vertebrae to make a backbone. And 230 million years ago, as conifers marched over the landscape, the ancestors of the Rockies were beginning to rise, and cicadas filled summer nights with their first buzz, a jawless fish died in what would later become a coal mine, south of what would later become Chicago. It was a ringer for the lamprey swimming in the Great Lakes today, though it had fewer teeth. No jaws. No bones. No scales. Simple and efficient.

As well as a barrier to industry, Niagara Falls had been a barricade against aquatic species. The most zealous spawner could not crest Horseshoe Falls or American Falls with a 170-foot leap. As a result, species that lived in Lake Ontario had not yet made it to Lake Erie and the chain of other Great Lakes connected to it. The sea lamprey was one of these -- it has a sprawling range spanning the Atlantic Coast, but was a foreigner to inland waters. It's unclear whether the sea lamprey is native to Lake Ontario, but it was present

there by the early 1800s. With the canal complete, however, all sorts of creatures discovered easy passage.

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The Canadians were not content with their over-budget, marginally-serviceable ditch. The canal was rerouted, deepened, and improved until it barely resembled its former self, always letting through more water, making the connection stronger, more clear. Interest grew. Control changed hands. It was as if Canada were an architect laboring over drawings of its future, worrying the original sketch, erasing and amending over the course of a century. From a project that began with shovels and wheelbarrows, the Welland Canal and its offspring sprouted a forest of machinery.

In 1845, the Second Canal retraced the route of the original, but deepened the passage. In 1887, the third Welland Canal was completed, guiding water through 26 locks in a channel no shallower than 14 feet. The fourth canal, opened in 1932-1933, abandoned the old launch-point at Port Dalhousie on Lake Ontario (chosen to shunt water past Twelve-Mile Creek and Merritt's mill) in favor of Port Weller, finally straightening the meandering curve of earlier attempts. In the new design, water flowed to a depth of 30 feet through 8 massive locks.

Who knows when the first lamprey set out to spawn, found its natal gravel pits disturbed, and kept going upstream, wriggling through new waters, until it found itself the first of its species in the fish-rich pool of Lake Erie? But in 1921, a fisherman in Merlin, Ontario pulled a sea lamprey from his nets. Along with other strange fish he'd found in Lake Erie -- a silvery

lamprey, a rosy-faced minnow, and Miller's thumb -- he sent it on to the Department of Biology at the University of Toronto. They included it, with no comment, in their 1922 list of the fish of Lake Erie. Erie's shallow waters didn't appeal to the lamprey, but it was easy enough to slip from there into the deeper lakes of Huron, Michigan, and Superior. Soon anglers were unhooking whitefish with circular wounds on their sides and hauling in lake trout with two or three lamprey dangling, still sucking. To fill vacancies created by lamprey attacks, inedible alewives moved in, outcompeting many native species and increasing the anglers' disgust.

By the mid-1940s, no one could ignore the effects of sea lamprey on the Great Lakes. The parasites scraped away at lake trout, rainbow trout, and whitefish, their fervor pushing two varieties of chub close to extinction. Fisherman reeled from losses topping \$5 million annually. In some years, 90 percent of the lake trout in Lake Superior had lamprey scars. Physical barriers to spawning grounds, lampricides, and releases of sterile males were all tried, and fish populations rebounded somewhat, but the lamprey found ways to persist.

The Welland Canal is now part of the St. Lawrence Seaway, a string of lakes, rivers, canals, and locks that allows ships to travel from Lake Superior to the ocean. These ocean-going vessels, lumbering more than 700 feet in length, make the original horse-drawn barges look like little maple sugar toys. The modern waterway towers over the Erie Canal which never achieved a depth of more than 12 feet and now attracts more pleasure boaters and historians than captains of industry. Since its opening in 1959, the Seaway has allowed coal, wheat, sunflower seeds, salt, iron, and more than 40 exotic species to pass through.

One of these was the zebra mussel, a mollusk native to the Black Sea, that may have been released into Lake St. Claire during the 1980s in ballast water from a ship that came through the St. Lawrence Seaway. Though benign in appearance, no bigger than a pistachio nut and modestly tucked between two striped shells, the zebra mussel is more despised than the lamprey. Coating oars and anchors, massing on crustaceans and clams, shutting down waterworks, the zebra mussel intimidates through sheer numbers. Shipwrecks, pilings, entire lake basins are covered in a prickly blanket. Native mollusk populations are in decline, and diving ducks that eat the exotic mussels ingest contaminants along with their meal. Traveling through another canal, the mussel found itself in the Mississippi and extended its reach all the way down to Louisiana. The ruffe, the spiny water flea, and Eurasian milfoil have also taken up residence in the Great Lakes, changing the ecosystem permanently.

The Northwest Passage, that magical link between Atlantic and Pacific, the ultimate canal from Europe to China, eluded explorers dreaming of Far East treasure. When it no longer seemed likely that the pounding surf or endless channel would appear just up one more drainage, they set out to carve a way through the land, if not all the way to the opposite shore, at least as far as possible. The goals changed from silk and spices to beef and wheat. They stitched lake to lake and wed salt water to fresh. But water, though it will flow into any vessel and adopt any shape, has stubborn properties of its own. As waves of exotics pound against shores as far inland as Lake Superior, it's as if the ocean is moving inland to reclaim those first molecules of brine that took the trip upstream in a decorated barrel, and were poured into Lake Erie by Clinton and his crew.

The Bug Hunters

One can't blame Benjamin Walsh for being a bit cranky. As entomologist for the state of Illinois, Walsh knew all about the exotic bugs that were eating their way through American crops of the 1860s. The currant worm, the Mexican bean weevil, the citrus mealy bug, the European red mite, the oyster shell scale, the elm leaf beetle, and the Hessian fly pummeled the agricultural economy, bankrupting some farmers and turning others to desperate measures. In attempts to thwart the insects, they built 9-foot high walls around their crops, drilled holes in their infested trees and plugged them with sulfur, and tried many other remedies so questionable that Walsh's fellow entomologist Asa Fitch was inspired to comment on one man's recommendation, "Methought he ought to have added that the hole should be made with a silver bullet, or at least that this operation should be done in the old `o the moon."¹

Walsh, scientific by profession, peppery by nature, had a similar lack of patience for these flimsy solutions. He, along with Fitch, was beginning to think that the cure for the plague of exotic bugs might be a dose of foreign medicine. One of the reasons the pests flourished in the United States, he reasoned, was that they were free from the natural enemies that kept them in check at home. Without constraint of the predator, they could breed themselves to pestilence in the New World while they were only a minor nuisance in Europe or Asia, or wherever it was that they originated. Explorers could seek out their predators, capture them, and ship them to the United States. But even before he imported so much as one larva, Walsh anticipated resistance. Entomology as a respectable profession was in its infancy and the last thing scientists needed was ideas that would make them a laughing stock. In an article for the *Practical Entomologist*, he wrote:

The simplicity and comparative cheapness of the remedy, but more than anything else, the ridicule which attaches, in the popular mind to the very names of "Bugs," and "Bug Hunters," are the principal obstacles to its adoption. Let a man profess to have discovered some new Patent Powder Pimperlimpimp, a single pinch of which being thrown into each corner of a field will kill every bug throughout its whole extent, and people will listen to him with attention and respect. But tell them of any simple and common-sense plan, based upon correct scientific principles, to check and keep without bounds the insect foes of the Farmer, and they will laugh you to scorn."²

The idea was not completely new. As early as 300 B.C., the Chinese collected parasitic ants and built bamboo bridges from citrus tree to citrus tree, so the ants could travel eating harmful insects. In 1762, Count de Maudare brought the mynah to Mauritius to eat red locusts. People have kept cats to

eat rats since the Pharaohs reigned. But in Walsh's time, the introduction of natural enemies had never been tried on a commercial scale in the United States before, and its success would take public by surprise and turn entomologists and bug hunters into heroes.

As Walsh finished up his article with few vigorous pen strokes, farmers in the far west rocked back on their porches and breathed in the fragrance of their fruit growing sweet and heavy in the California sun. So many species flourished, fed by rains from the coast and the heat of inland valleys, that those who came west for the mining stayed for the agriculture. After the rocky fields and tired earth of New England, this land seemed full of possibility. They set themselves to busily changing the country from a place where gold rolled down the rivers to a place where it dangled, juicy, on the trees. Farmers tried grapes for wine, mulberry trees for silkworms, and poppies for opium. Citrus trees, brought to keep scurvy from miners, flourished. They planted avocados from Nicaragua, prunes from France, and melons from Turkey, then let the Mediterranean climate work its magic.

But the plants didn't travel alone. Nestled in the veins of the leaves, tucked in the curve where stem grasps branch, or crouched in a forest of anthers, stowaways lurked. Eggs, caterpillars, tiny flies -- all entered the Golden State unnoticed, clinging to the plants they had evolved to eat. This rush of exotic plants (almost 600 non-native species and varieties of trees arrived between 1810 and 1942)³, planted in large fields devoted to one crop only, generated plague after plague of insects, more intense than those witnessed in the East. No one knew where the next attack would come from, and everyone feared an unfamiliar rustle in the leaves.

In 1868, two years after Walsh's article appeared, a sugar refiner named

George Gordon found a small white scale insect on his Australian acacia in Menlo Park. Gordon captured one of these peculiar insects and sent to scientist R.H. Stretch in San Francisco. Stretch passed it on to Charles Valentine Riley, entomologist for the State of Missouri and a protegee of Walsh. While the bug men puzzled over the identity of the puffy white newcomer, the scales picked their way through an environment well stocked with familiar and edible trees: eucalyptus, acacia, Australian oranges and lemons, to name just a few. Helped by the wind, they spread to backyards in San Raphael, San Jose, and Santa Clara. A San Francisco nursery sold infested plants to a customer in Los Angeles, and soon Southern Californians were cutting back and burning their trees in an attempt to purge their gardens of the pest.

Before long, citrus farmers noticed their trees weakening, growing ill, and dripping with a black ooze. Clusters of insects wrapped each branch, mouth parts stuck through the bark, sucking the sap. The insects themselves were reddish, but their most prominent features were a sugary honeydew excreted from their rear, and egg sacs which ballooned out from behind mature females. The honeydew trickled over the twigs and branches, growing a black mold over time. The egg sacs, larger than the bodies themselves, had white fluted ridges giving them the appearance of madelaines, cotton swabs, or cushions, and the bugs were dubbed "cottony cushion scales." Each sac contained 600 to 800 eggs, which turned into tiny orange-red nymphs, prominent against the pale balloon. In no time, they were everywhere. Males were rare: the species was largely hermaphroditic, though the farmers didn't know it. All they saw was ruin.

Meanwhile, in the nine years since the scale first crossed his desk, Riley

had become the chief of the Bureau of Entomology for the United States Department of Agriculture. First hired in 1878, he was gone a year later after internal squabbling. But by 1881, with a new administration, he was back. Riley looked more the romantic poet than the scientist, with a sweeping wing of black hair, pale cheeks, and wide-spaced almond-shaped eyes. Born in Europe and initially trained as an artist, he turned his colored pencils to sketching insects soon after he came to the United States at age 17. Vivid portraits of the country's most hated bugs emerged from his study, accurate down to the last hair of a fly's leg. He earned a reputation based on studying the life histories of crop pests, cultivating an intimate knowledge of what he would destroy. Some called him brilliant, passionate, and hard-working. Others thought he was an arrogant glory-seeker.

As the Californians increased their pleas for help, Riley turned his attention from grasshopper outbreaks and Yucca moth biology to the plight of the fruit growers. In the time since he received the first report, a New Zealand entomologist identified the scale as *Icerya purchasi*. His friend Walsh's idea tickled at the back of his mind. All evidence indicated that the scale came from Australia, he wrote in his annual report to Congress in 1886. Why not send a special agent over to collect natural predators of the scale and bring them back to munch on California's growing population?

Actually, Riley knew why not. Peeved by his jaunts to Europe at government expense, Congress zeroed out the travel budget for USDA officials to go abroad. For the time being, he was stuck with local remedies.

Riley's two special agents in California had both been edged to the country's fringe by circumstances beyond their control. Daniel Coquillett had been forced to the warm, dry West by his tuberculosis. Albert Koebele, a

German immigrant, had worked for the USDA in Washington D.C. for several years before asking to be transferred far away to escape a love affair gone bad. Riley sent him to the Pacific coast.

For the man who would be hailed as the savior of the California citrus industry, Koebele didn't look the hero's part. Instead he looked rather like what he was: a meticulous preparer of insect specimens who kept his eyes trained on twigs. A small man, he lacked the radiant charisma of Riley. His clothes were rumpled. His mustache splayed in an unruly brush at both ends. With dark hair and eyes and a short forehead, he gave the impression of a small bird of prey -- a kestrel that seeks out and pounces on grasshoppers in the dirt.

At Riley's request, Coquillett and Koebele focused on the cottony cushion scale. They observed the density of scale clusters on pomegranate, quince, and eucalyptus trees. They counted eggs in the fluted sacs and measured the joints of larval antennae. Unearthing pupae from cracks in the dirt and pulling adults from underneath bark, they picked them apart, recording every detail. Then they sprayed them, and sprayed them again, noting how and whether they died. Kerosene emulsions, whale oil soap, caustic soda, and a tobacco wash rained down on the scales, but they managed to find refuge in leaf curls and split bark. Most of the carefully prepared concoctions soaked into the ground.

While his agents collected field data, Riley worked on Congress. He included a heated plea for a trip to Australia in each of his annual reports. The California State Board of horticulture sent a petition to the federal government outlining the state's citrus woes and suggesting Congress earmark \$50,000 to introduce predators of harmful insects. Finally, in 1888,

Congress agreed that Riley could send an agent to the International Exposition at Melbourne. He was supposed to represent the Department of State, but everyone knew his real mission: hunting bugs.

With the bureaucracy thwarted, the challenge began. While other entomologists had been content to send back dead samples of their discoveries preserved on a pin, Koebele had to bring back live insects in good health, in a large enough population to establish the species. Because of the dire straits of the California farmers, this mission was shot through with a kind of urgency and practicality not available to those merely seeking a new variety of butterfly.

Koebele left for Australia aboard a steamer on August 25, 1888. His particular instructions were to gather *Lestrophonis icerya*, a small fly reported to breed within the bodies of the cottony cushion scale. Before he left, he and Coquillett actually had already received two shipments of the fly from Frazier S. Crawford, a photolithographer in the office of the Surveyor General in Adelaide in April. Riley was particularly enthusiastic about its potential.

Once in Australia, Koebele looked up Crawford, who offered to help him with his search and give him more of the parasitic fly. Then, sometimes with company and sometimes alone, he did what he had come to do: scour the countryside. He kept his eyes open, and found something of interest everywhere. Several cottony cushion scales sucked sap on the grounds of the town hall in Sydney. At his Brisbane hotel he found an *Icerya* on an ornamental plant. Tiny spiders spun webs on the scales' fluted egg sacs in a graveyard. While crowds bustled through the International Exposition, he hunted and captured the infested scales in a nearby park. In Melbourne, the parasitic fly swarmed on the branches of sweet pittosporum -- shiny leaved

shrubs with fragrant white flowers -- just inside a gated churchyard. Koebele considered hopping the fence and filling his vials, but was dissuaded by an unsympathetic policeman. As he worked, locusts flew by overhead, seeking new sources of food in an unusually dry season -- 108 degrees Fahrenheit in the shade.

And then, on October 15, strolling past orange trees in a North Adelaide garden, Koebele saw a ladybug he didn't recognize. Covered with a shiny red shell like most of the ladybugs he knew in the United States, this one had black streaks not spots. The designs radiated out from a line down the center of the beetle's back, like a pattern made by a child who dripped ink on a piece of paper, folded the paper in half, then opened it again to dry. His companions didn't know what it was, but a fat cottony cushion scale was disappearing into the ladybug's mouth.

He found more near the Murray River and carefully collected them. Along with flies for which Riley had great hopes, he packed them on three live orange trees in a glass case designed for growing ferns, and added a healthy supply of *Icerya* to feed the predators and parasites on their way. He put more of the flies and beetles in various stages of development in boxes on ice so they wouldn't hatch, and together they steamed off home.

Back in California in late November, Coquillett received the goods, including the 240-pound case with the trees. Ladybug larvae wandered along the outside of the glass case -- he guessed they had escaped through cracks in the putty. He had built a tent around an infested orange tree in preparation for the insects' arrival. When he brought the packages inside, the lady bugs approached the first *Icerya* they came across. And pounced.

Chance and sloppy handling destroyed Koebele's second shipment of

12,000 insects. Someone repacked his carefully prepared boxes and branches covered with larvae. Ice fell on some, crushing tins and their contents. Others grew moldy on the trip. When Coquillett opened the dented and mashed packages on December 9, one fly, one lacewing, and one ladybug crawled out. But in January, after Riley put pressure on the San Francisco port to let his shipments pass through unmolested, Coquillett received additional pupae and larvae of the flies and ladybugs. These too he brought to the tented tree so they could take part in the experiment. Koebele returned with the last of the shipments, still fretting over the disastrous treatment of the squashed cargo. On the ride home, he placed them in cold storage and asked the butcher every day how his specimens were. To the little entomologist's anxious queries, the butcher replied every day, "Your bugs are all right."⁴

Underneath the netting, the ladybugs feasted. They, *Vendalia cardinalis* (later recategorized to *Rodolia cardinalis*) craved *Icerya* at almost every stage of development. The larvae devoured the scales from below, while the adult beetles munched on them from above. When it came time to lay eggs, the female *Vendalia* often lifted the scales to place an egg underneath, or attached an egg to the scales' eggs sacs, readying their offspring for their first meal. By April, the orange tree in the tent was practically picked clean. Coquillett opened one side panel to let the ladybugs forage elsewhere, and they lifted their hard red upper wings, unfolded their large, gauzy underwings, and zoomed away.

As they spread, so did the tales of the battle royale which was visible to anyone with a magnifying glass. The ladybugs were victorious in 35-acre orchards, then 150-acre orchards, then 350-acre orchards. The scales took refuge in the plants surrounding the farms, but the *Vendalia* found them.

Trees once covered in black slime reemerged. At state insectaries, people lined up with pillboxes to take the beetles home to liberate their own trees. Visiting a plot where the scale and ladybug had recently done battle, Coquillett saw only these remains of the fight: “the dry bodies of the *Icerya*, still clinging to the trees by their beaks.”⁵

The experiment had worked. Whatever Walsh and Fitch and Riley imagined when they thought of vanquishing agriculture’s demons with the broadsword of science, this exceeded their most vivid fantasy. Ladybugs were the perfect poster insects for biological control, as they lived in the popular imagination even before they slayed the vile scale. Superstitions warned against killing them; nineteenth century gardening books urged readers to treat the shiny red aphid eaters well. In England, “ladybird” was a term of endearment. In addition to good wishes, the beetles had an additional weapon in their arsenal which allowed them to increase without being preyed on heavily themselves. While the bright red color endeared ladybugs to people, it warned birds and other predators to stay away. Some insects’ danger signs of red and yellow are false advertising: the ladybug’s is genuine. When captured, the insect leaks bitter blood from its joints, assuring that the meal-seeker would try elsewhere next time. In addition, they adapted easily to the California climate and focused exclusively on the prey the USDA chose for them. The *Vendalia* made it look easy, and people wrote to Riley requesting shipments of the beetle to combat all sorts of insects.

Whereas just a few years before, Riley, like Walsh before him, had to argue hard to convince anyone that biological control would work, now he had to face down the hype. No, the prey species would never be completely destroyed; No, not just any ladybug would do; No, the ladybugs wouldn’t

work against every pest. He even issued a warning: if the bug hunters weren't careful, they might introduce a species that would outcompete a similar native species by performing a job that was already being done well.

In spite of his warnings, though, the "ladybug fantasy," as one observer termed it, was just getting underway.

Now that success was assured, the question was, who deserved the credit? Mr. Craw, the Horticulture Quarantine Officer of California, was sure he merited it for first suggesting the idea of importing exotics to destroy the scale. Frank McCoppin, one of the Commissioners to the Melbourne exposition figured he saved the citrus industry by arranging for Koebele's Australian trip to be paid from exposition funds. Mr. Crawford, the photolithographer who greeted Koebele in Australia, felt his contributions as the discoverer of the parasitic fly, were slighted. Riley, who now padded his annual reports with glowing letters of praise from California farmers, noted that the trip was made by one of his employees at his request. And for many members of the public, the obvious answer to the question of who deserved the credit was "Koebele," the brave explorer. The California State Board of Horticulture gave him a gold watch and presented his wife with diamond earrings. In Germany, his home country, they referred to biological control as "the Koebele method." Others termed it "nature's way."

As a result, Koebele's career took off. In 1891 he made a second trip to Australia and New Zealand, still working for the USDA but with his expenses paid by the California State Legislature. Focused on ladybugs, he collected one species that ate the woolly aphis, another that preyed on the red scale. Only 28 beetles reached Los Angeles alive, but Coquillett did what he could with them. In later years he would also send the six-spotted, Asiatic, four-spotted,

and black ladybugs, as well as many others. Other collectors gathered ladybugs as well, including the seven-spotted ladybug, *Coccinella septempunctata*, brought over in 1900.

In 1893, Koebele left the USDA, partially as a result of tensions over credit with Riley, and went to work as entomologist for the provisional government of the Republic of Hawaii. On Hawaii's behalf, he searched through grasses and along tree limbs for parasites in Japan, China, Ceylon, and the Fiji Islands. He scoured Mexico for enemies of the Lantana weed and the mainland U.S. for parasites of the sugarcane leafhopper and the horn fly. Like a souvenir collector, he selected a bug from every land, sure it would have it use. Meanwhile Riley, tired after struggling within the bureaucracy for so long and eager to renew his energies by getting back out in the field, quit the USDA in 1894.

A year and a half after springing himself from his job, Riley set out on a bicycle ride with his son. It was mid-September, the harvest season, and as they raced downhill in Washington D.C., crates of California peaches, plums, and pears steamed to London's Coventry Garden Market. Picking up speed, the entomologist hit a rock, flew over the handlebars, and cracked his skull on the pavement. Help found him bleeding from the ears and unconscious. He died before midnight.

The United States Department of Agriculture, basking in the praise of grateful California orange growers, sent special agents in other divisions on collecting missions. A realization of the world's biological riches was taking hold. In 1898, the USDA launched a plant collecting program by sending agent Mark Carleton to Russia. He returned with a new variety of wheat so tasty that it made the Americans wonder what they had been eating these past few

centuries. In 1905, plant collector Frank Meyer took his first trip to China. Over the course of his career, he brought back alfalfa sprouts for salads, lilacs for backyards, and elms for prairie shelter belts from travels to Asia, Europe, and Siberia. He introduced 2,500 new plant species in his lifetime.⁶ For so long a destination for treasure seekers from Europe, the United States was beginning to look to other countries to see what riches they had to offer.

But the more insects that were introduced, the more miraculous the *Vendalia* seemed. Many bugs brought by Koebele and other collectors couldn't survive the climate change, traveled with predators of their own, switched their attention from the target pests to another species, or, most often, just disappeared into the waving grass when released. Some introductions were more successful than others -- each box swarmed with insects and hope, but none was the *Vendalia*. Koebele went to Europe in 1908 on a collecting mission, and there became ill, including problems with the eyes that held him in such good stead. World War I prevented his return to the U.S., and even afterwards he couldn't get permission. After paving the way for insects of every stripe and spot, Koebele could not import himself, and died in Germany in 1924. A former mayor of Alameda, California, who tried without success to help Koebele re-enter the U.S. and failed, commented, "I feel ashamed to eat another orange."⁷

Though the careers of both Riley and Koebele faltered after the introduction of the *Vendalia*, their legacy was assured. California bought into biological control wholeheartedly, and the tale of the rescue of the citrus industry appeared as round and bright and sweet as the fruit the ladybugs had saved.

But nothing is as simple as it seems. The story has a sequel, darker than

the original. The first problem was that, as the *Vendalia* miracle failed to repeat, people looked for other solutions. And, as Walsh had predicted, when the Patent Powder Pimperlimpimp made its appearance, everyone rushed to buy it. Concoctions that before the turn of the century left trees damp but still pest-filled, were now being brewed to a lethal efficiency. Insecticides were coming into their own, and even California, so enamored of biological control from years after the *Vendalia* introduction, was coming around. One of these new chemicals had been available since the turn of the century, but was only promoted as an insecticide during World War II. It was powerful and cheap. Soldiers dusted themselves with it to get rid of lice. The government sprayed it on the walls of shacks in the South to get rid of malaria-bearing mosquitoes. Foresters watched it do in gypsy moth caterpillars and other forest pests. It seemed as potent an evil-fighting weapon as the Spitfire. It was called dichloro-diphenyl-trichloro-ethane, or DDT.

Even before Rachel Carson's *The Silent Spring* pointed out the dangers of pesticides, citrus growers noticed the first heavy outbreaks of cottony cushion scale in years after sprayings of DDT. Unfortunately for the ladybugs and their champions, the insecticide appeared to have a minimal effect on the cottony cushion scale, but it could kill a *Vendalia* two months after it had been applied. Even after DDT was banned, the dominance of insecticides over biological control didn't falter. Today in California *Vendalia* still eat *Icerya* off the branches of orange trees, but the farmers are much more reliant on insecticides than before. The balance has tipped and no one has much patience for "nature's way" any more.

The second problem was that the craze for ladybugs, although abated somewhat, continued. When the Russian wheat aphid appeared on crops, the

search for ladybugs to eat them was on. One of the contenders, originating in the palearctic, *Coccinella septempunctata* (or the seven-spotted ladybug) finally became established after repeated introductions, beginning in 1900 and continuing through the 1990s. They spread from field to field with the help of humans who saw that colonies were placed in every state and ate aphids with relish. But one study in South Dakota showed that this burgeoning population crowded native ladybug species who relied on the same limited number of aphids, and pushed them into decline. Since the total number of ladybugs in the plots of corn and alfalfa remained roughly the same as the introduced ladybugs increased and the native species decreased, the scientists working on the study wondered if any more aphids were being eaten than before. An Asian ladybug, *Harmonia axyridis*, recently appeared in the South and is swarming through the country by millions, gathering in masses on light colored buildings that resemble cliffs near its native home. Big and orange rather than red, *Harmonia* is edging out native ladybugs as well, and spreads with the help of those who hope it will eat their aphids.

But despite all these half successes and partial failures, some biologists carried around the well-worn story like a good-luck stone in their pockets. Even if they hadn't been there, they saw the ladybugs burst from the netting and head for the infested trees. They relived the moment that the scales and the black fungus that accompanied them disappeared like dew in the sun. To the scientists, it seemed such a graceful solution. It seemed like a vindication, an affirmation, a triumph of logic and biology over the brute methods of poison and spray. To some, it still does.

Mission to the North

Sitting at their desks in Washington D.C. or in their New England homes where dim light shone on polished wood, the missionaries, teachers, and government officials who had visited Alaska for a week or a year must have been haunted by images of the far north. As grandfather clocks and fat pocket watches ticked off the sleepy minutes, they saw the timeless glow of the midnight sun at Point Barrow. They remembered wrecked whalers dragging supplies onto the beach. Crewmen pulling powder on deck to blast a hole through the ice. The barking cry of seals as they slid off the rocks. The sharp green spikes of the *Aurora borealis* piercing the night sky. Against these landscapes, painted in memory's vivid colors, their present surroundings may have seemed only faint sketches. Dust settled on the arms of chairs and in the nooks of couches. China balanced on bright white tablecloths. Lace curtains scraped against the panes. And they were restless.

Sheldon Jackson, Presbyterian minister and General Agent of Education in Alaska, had seen all this and more. By 1891, two sights had come into particularly sharp focus. One was the Eskimo villages he'd passed through on his summer tours of Alaska, once full of life, now housing only a few sick and dying. The Eskimo depended on the whale and walrus for food, and both were increasingly the targets of white hunters. The caribou of the interior were falling in great numbers now that both whites and natives pursued them with rifles. In 1890, a school teacher wrote to the Commissioner of Education of the conditions he found there. "The orphan children in nearly all, if not all, of these settlements are in a most pitiable condition....They are starved and subsist on half rotten fish and whale oil or seal oil with a little dry bread....The old race of people here are dying of (sic) rapidly."¹ The Alaskan natives appeared truly on the brink, and Jackson carried with him pictures of the gaunt faces and empty homes where occupants had died over the winter.

The other image lingering in his mind was that of herds of reindeer along the Siberian coast and the people who lived with them. The Siberian deermen, who owned these animals and herded them by following their long migrations, appeared well fed and content. Their substantial tents covered with reindeer skins and their warm clothes of the same material offered proof of their prosperity. A deer meat feast could be had by just rounding up the herd. In the interior, countless numbers of reindeer grazed, offering a ready and replenishing supply of flesh, bone, antler, and hide. The two cultures were not far from each other by ship.

Jackson had an idea.

* * * *

If energy courses through our bodies like an underground stream, Sheldon Jackson possessed deep wells that never ran dry. Forging off northward every summer, dragging large mammals across the Bering Sea, sending Eskimo children to Pennsylvania, shipping Finnish families to Alaska--all these would have exhausted a small government, but Jackson thrived. Houses and school buildings sprung up in his wake, as if nails broke board and rocks nestled into neat walls sheerly by the force of his will. In photograph after photograph, he looks off the frame, far to the upper left, his whole head turned away, a portrait of a man propelled from the inside, following his own personal compass. Words like "zeal" come to mind.

Born in 1834 in Minaville, NY, educated at Union College and the Princeton Theological Seminary, Jackson's primary drive from the time he graduated was away from the civilized cities of his upbringing. His first impulse was to preach in China or South America, but when a doctor implied to the missionary board that young Jackson's health wouldn't stand such journeys, he tethered his ambition and set out for the western territories, seeking heathens closer to home. Soon he had established Presbyterian churches in Colorado Springs, Colorado, Laramie, Wyoming, and Helena, Montana, ministering to many small pockets of miners along the way. Then he turned his gaze south and preached in Las Cruces, New Mexico, and Tucson, Arizona. Finally, in 1877, he extended his reach even further, gaining permission from the church to civilize and educate Alaska.

During the summers, he traveled from the southeastern island chains

all the way to Point Barrow, setting up churches and mission schools wherever he could. By 1885, Jackson was such an expert on the area and its inhabitants that the U.S. government appointed him General Agent for Education in Alaska, giving him both religious and secular missions in the newly acquired territory. Every fall he came back bursting with stories of rivers, and bear, and the strange customs of the natives. Conservationist John Muir was partially inspired to see Alaska by hearing Jackson speak at a Sunday school convention in Yosemite Valley. After spending a decade roaming the Sierra Nevadas, Muir hopped on a ship heading north, accompanied by missionaries, Jackson included. As they took side trips to explore rivers and glaciers, one small canoe hardly seems strong enough hold two such determined wills, two such romantic notions tugging in opposite directions. One whose beard religiously neat; the other whose flowed unruly down his chest. One who sought to bring salvation to the wilderness; one who sought to find it there. One who would soon picture reindeer pulling sleds and carrying mail to Alaskan villages; one who envisioned caribou growing fat on the plentiful grass. What Muir thought of Jackson can be gleaned from his grumblings about the stingy missionaries and his dismay as they collect artifacts from a Native American graveyard. He writes of missioning to the missionaries, answering all of their questions about geology, and "preaching the glacial gospel in a rambling way."² What Jackson thought of Muir is beyond imagination.

Despite their differences, Muir and Jackson together were powerful advocates for Alaska. Images of the night sky above calving glaciers and thick forests that had never been harvested from Muir's columns in the *Daily Evening Bulletin* of San Francisco loomed side by side with Jackson's portraits

of needy Eskimos. Men and women, young and old, experienced and novice, felt a sudden calling to teach in the far reaches of the arctic. How thrilling to leave behind the land of letter openers and feather dusters and head into country more bare and forbidding than even the endless plains and ice-crusted peaks of the West. These pictures and more flitted through the minds of the office clerk in Boston or the young woman mending shirts in Poughkeepsie before they sat and wrote their letters to Jackson requesting a post as far away as he could arrange it.

Over the course of his Alaskan journeys, Jackson traveled with and befriended Michael Healy, Captain of the *Bear*, part of a fleet called the Revenue Cutters, precursor to the Coast Guard. Before taking command of the *Bear*, Healy had worked on the U.S. Revenue Marine Steamer *Corwin* with Charles H. Townsend, who noted as early as 1885 that importing tame reindeer from Siberia might be a way to help the Eskimo.

The notion appealed to Jackson for a number of reasons. Fresh from the West, he had observed how life unfolded out there as civilization leaked into the emptiness. When Jackson first took his Bible and traveled from small town to mining camp, the stagecoach passed hundreds of thousands of buffalo. By 1891, as Jackson planned to buy his first reindeer in Siberia, the remaining buffalo only existed in isolated patches of fifty or so. Vast reaches of prairie stood ungrazed and the plains tribes tried to feed themselves by gathering and selling bones. With the buffalo gone, whites were finding the hungry Native Americans a heavy responsibility and they searched for ways to avoid similar problems in Alaska.

On a more positive note, the missionary had seen what he viewed as a waste of plains in North Dakota and Montana converted to productivity, at

least for white ranchers, by cattle. In his view, stocking the tundra with reindeer would create a similar transformation. Useless would become useful. His efforts would cause "those vast, dreary, desolate, frozen, and storm-swept regions to minister to the wealth, happiness, comfort, and well being of men."³ Domesticated animals--easy to care for, under control--would replace wild ones. A hunting culture, viewed as "primitive" by Jackson and many of his contemporaries, would change into a herding culture, moving up a rung on the ladder of civilization. Once Jackson heard the idea, it was only a matter of time before reindeer wandered over the Alaskan tundra, pawing craters in the snow in search of enough lichen for a North American winter.

Initially denied funding from Congress for the reindeer scheme, Jackson launched a newspaper campaign in 1891. *The Mail and Express* in New York, *The Boston Transcript*, *The Philadelphia Ledger*, and several Christian newspapers carried his request for funds to buy reindeer at \$10 a head for the poor Eskimos. And the public responded to his urgent pleas. Small checks for \$5 and \$10 stacked up, accompanied by impassioned letters explaining how the writers could barely spare any money, but they'd heard about the fund-raising effort in church and felt obliged to help. An elementary school in Baltimore raised and sent \$1. Young ladies at a seminary collected \$50 and mailed it in. Another \$15 came from a sympathetic official at the Crow Indian Agency in Montana. By mid-summer, Jackson had \$2,150. Even before the final numbers were tallied, Jackson and Healy sailed to Siberia, their ship, the *Bear*, stocked with dishes, beads, traps, guns, and tobacco to trade for deer.

Even though the Siberian reindeer were domesticated, they inhabited a

society far from the cattle ranches of Texas. To the minister and the ship captain, the Siberian's treatment of their herds appeared shrouded in superstition rather than sound principles of animal husbandry. When Healy wanted a deer slaughtered for meat, a Siberian deerman shooed Jackson away from a family circle, then led one animal apart from the herd. The reindeer's owner faced east and sank into prayer, then gave a signal whereupon the deer was stabbed in the heart with a knife. The reindeer sank to the ground. Finally, the owner gathered hair and blood from the carcass and threw it to the east, still praying. For Jackson, Captain Healy, and his crew, the barnyards and cow pastures of the lower territories probably never seemed farther away.

But obtaining a dead reindeer was the easy part. Rumor had it that the Siberians believed selling a live deer was bad luck. Because of their superstitious nature, they would never part with one still breathing, reports said. Another, less mysterious reason for their reluctance may have been that the Siberians used the reindeer skins to trade with Eskimos, and didn't want this business to disappear. Jackson dismissed these concerns as "selfishness" and evidence that "they have no knowledge of such a motive as doing good to others without pay."⁴ He would not be denied.

The *Bear* left Siberia carrying sixteen reindeer, and deposited them on Amaknak and Unalaska Islands to overwinter . During the fall, Healy wrote to tell Jackson that the small herd was doing well, especially a favorite who'd strayed and then come back to the fold. Her name, the ship captain decided, was Bessie.

Back in the States, Jackson campaigned for a larger, government-funded reindeer introduction on the mainland the next year, 1892, telling more tales of the beauty and hardship of life on the ice-locked frontier. The

danger, though thrilling, was real. One missionary had already been murdered and another tarred and feathered for interfering with the business of whisky smugglers. At the end of May, as Jackson prepared for a second introduction, still without government support, a steamer returning from Alaska reported that Jackson himself had been shot in a scuffle with Yukon Indians who were smuggling alcohol. But Jackson outlived the reports of his death and continued with his plans.

* * * *

Early on July 4, 1892, the *Bear* glided into Port Clarence, tucked into a bay near the tip of the Seward Peninsula. The just-emerging sun warmed the chill only slightly, but the day was calm, the water smooth. In the dawn light, a crowd of teachers and government officials and Eskimos formed a curious welcoming committee, waiting on the rocky shore for the reindeer to disembark. Up the rise beyond them, a flag marked the newly-built reindeer station. Salt and anticipation tinged the air. Jackson oversaw the operation, dressed in his fur suit decorated with a double row of white diamonds on the hem, modeled on those of the Eskimo. Underneath the fur neckline, a stiff white collar peeked out.

On board, 53 reindeer breathed visible clouds in the cold air. Not long before, they'd been smelling out waterlilies and marsh marigolds and nibbling birch shoots and mushrooms in their Siberian summer pasture. Then they were lassoed and hobbled and dropped on the beach. They were hauled to the water and set afloat. As the *Bear* steamed by snow-covered rises that brought ice almost down to the water, they'd shifted and strained against

the ties on their feet. Now the process ran in reverse. The crew wrapped a piece of fabric around each reindeer's body, then attached each harness to a pulley which hoisted the reindeer up and off the deck. Men carried the animals on stretchers like war wounded from the beach up to the station. Then they removed the straps that bound the reindeer's broad hooves. Once freed, the bulls and cows charged off in all directions in a burst of release and panic, thundering half a mile or a mile over rocky ground before one by one returning to the familiar scent and warmth of the herd.

Somewhere further along the coast, the caribou had come from Alaska's interior to let the salt air blow away the mosquitoes and warble flies that were fired with blood lust this time of year. Thousands of years ago, their ancestors had walked to North America. But even now that the Bering Land Bridge lay deep underwater, their cousins had come to join them.

* * * *

Reindeer and caribou are the same species (*Rangifer tarandus*), but different varieties. Reindeer, smaller with shorter legs and more varied fur, are known as *Rangifer tarandus tarandus*, while the barren ground caribou that live in Alaska are called *Rangifer tarandus granti*. While physiologically they are similar, their history with humans is very different. Reindeer all across northern Asia and Europe had been domesticated for hundreds of years, while the caribou of Alaska and Canada never were.

Reindeer and caribou, like the bison they evoked, awed travelers by their abundance. Accounts rarely speak of one reindeer and its individual expressions and qualities, but rather what impresses are the huge herds,

thousands of animals migrating in a surge of motion that can shake the ground for hours, days. Their hooves, soft and tender for tundra walking in the summer, hard and strong for cutting into the snow in winter, leave round prints like a set of parenthesis. As they move, tendons in their feet slide over bone, creating a click. Mothers and young may snort to one another, adding noise to the river of backs. When the reindeer and caribou are examined individually, their power is diluted and a certain goofiness comes to the fore. The nose is midsize, somewhere between the delicate proboscis of a mule deer and the honker of a moose. Perhaps the most impressive feature is the antlers, present on males and females alike. A large rack sweeps backwards, full like sails in the wind or the hull of a ship. Of the tines that extend forward, over the eyes, one is often more pronounced than the other, forming a large, solid palm of bone that looks rather like a shovel. Their fur ranges from mouse gray to deep brown to white closer to the Arctic. Hidden within their skin most likely is the larva of warble flies, whose parasitic fervor may spur caribou's migratory impulses.

While few Americans had actually met a reindeer in the snorting, parasite-ridden flesh, most had seen pictures of the beasts invested with magical powers, pulling a sleigh heavy with gifts. Throughout the nineteenth century, they pranced across Christmas cards and poked their noses into holiday advertisements. Their clatter on the roof announced Santa Claus, and they could fly, hinting at the strange things that happened near the North Pole.

Even the practical work of harnessing and milking and slaughtering the animals didn't dull their legendary glow. When W.T. Lopp, a teacher who later became Superintendent of the Teller Reindeer Station, first glimpsed the

transported herds with his wife, he commented "It seemed as if we had suddenly stepped into the fairy land of Santa Claus, although, when seen in the distance, the deer resembled a herd of cattle quietly grazing on a gentle hill slope in the States."⁵ Miner W. Bruce, a teacher and the first Superintendent of the Reindeer Station, took the fantasy even further. One Christmas Eve, after he had instructed his Eskimo students in the traditions and religious significance of the holiday, he loaded up a sled with parcels of sugar cubes, dried apples, and raisins, hitched up the reindeer, and traveled from house to house through the snow. Catching sight of the reindeer as they paused before a lighted window, Bruce pondered the vision: "It occurred to me that perhaps this was the first time in the history of civilization that a live Santa Claus made his midnight visit upon an errand of mercy with a team of reindeer, and that the Eskimo were the first to actually experience what throughout Christendom is only a myth."⁶

But here, the reindeer themselves were the gifts. The hope they represented and the need of the Eskimo gave meaning to a holiday that by the end of the nineteenth century was already appearing too commercial and stripped of holy purpose. Townsend, one of the first to suggest bringing reindeer to Alaska, picked up their religious potential from the start. "In our management of these people, 'purchased from the Russians,' we have an opportunity to atone, in a measure, for a century of dishonorable treatment of the Indian,"⁷ he wrote. Jackson put a different spin on the moral character of offering domesticated animals to the Eskimo, viewing their shift to agriculture as part of the conversion process. Like no other single action, the transportation of reindeer served a religious purpose both for importers and beneficiaries: charity, salvation, and atonement for the loss of the buffalo.

With every hairy introduction, Jackson paid heed to his calling.

* * * *

As the animals became established, the air buzzed with ideas for their use. They could carry the mail between Eaton and Nome, provide transportation for from rivers to mines in the interior, rescue whalers locked in ice. An ideal blend of cow, horse, and sled dog, the reindeer offered something for everyone. Sinew, tooth, hoof -- all could be put to work. The reindeer promised to be so useful, in fact, that once they were across the Strait, the whites had a hard time parting with them.

During the first few years, most of the herds were under control of the reindeer stations or missions, with native herders-in-training promised several each year. Jackson brought herders from Lapland to train Eskimo and missionaries alike and promised a portion of the reindeer to them. He launched his dreamed-of reindeer mail service, while other government officials turned a small island into a reindeer experiment laboratory. Taking advantage of the fact that, being the same species, reindeer and caribou can interbreed, government officials released both varieties on the island to see if they would produce "carideer." The bulked up reindeer pleased their creators, but were too scientifically valuable for the island natives to eat.

But even when an Eskimo did accumulate a sizable number, the herd was never really his. Charlie Antisarlook, one of the first native herders in the apprentice program, received a loan of 100 deer, with the understanding that he would keep the increase and return the original number of deer after five years. After three years, though, the government took back its deer to

bring supplies to miners on the Yukon. Shortly thereafter, the government requested Antisarlook give them his reindeer as well to form a rescue mission for whalers trapped at Point Barrow. The reindeer arrived with much fanfare but too late to help the whalers, who rescued themselves in the meantime. Antisarlook eventually received the reindeer back, but his village teetered on the brink of starvation while they were gone.⁸ Jackson wanted to do this generous and charitable thing, but couldn't seem to carry it off with grace.

As gold was discovered in 1898 and miners flooded in, private ownership of reindeer became a more lucrative business enterprise. Russia stopped selling reindeer to the U.S. in 1902, but the more than 1,000 that made it across the Strait were multiplying. The tensions over how to best apportion the animals increased. The disparity between the goals for the reindeer and the uses to which they were being put caused Jackson to lose his job as General Agent for Education in 1908. The criticism heaped on him for mixing Presbyterian and government purposes and for mismanaging the reindeer, as well as mounting illness, pushed him to resign. Jackson died in May of 1909, and was buried back at his birthplace--Minaville, New York.

And the ownership struggle continued. Even though it had long been illegal to sell female reindeer to whites, they managed to acquire them anyway. In the 1932 general round up on the Seward Peninsula, natives owned 88,673 of the deer, one white-run corporation owned 34,235, Lapps owned 615, and 2,250 were owned elsewhere. So in this year and place, a single non-native business owned more than a third of the reindeer.⁹ And the natives had a hard time making money from the deer they did possess. White herders charged a \$1 per year herding fee and would buy the reindeer

for \$3 a head. L.J. Palmer, who studied the feasibility of reindeer raising, explained the economics of native reindeer ownership this way: "Well, there is no profit in the sense that he is producing something for sale, but it would mean a profit over the consideration of leaving the animal to die on the range."¹⁰ In 1940, the United States government bought all reindeer owned by non-natives in order to redistribute them, but by that time interest in making a living in the reindeer industry was waning.

Another problem with Jackson's vision of a new Wyoming up north, was that the Eskimo didn't want to be cowboys, or cowgirls, or reindeer men and women for that matter. Many preferred not to leave their ancestral lands by the shore and travel inland, following the herds. They wanted to hunt and fish as they always had, and if the reindeer offered more animals to hunt, all the better. Even those who were interested in and willing to herd left the reindeer when it was time to dry salmon and participate in village ceremonies and celebrations. The Lapps were alone in the eagerness of entire families to move from place to place as the reindeer migrated through the seasons.

But the reindeer knew nothing of arguments between owners, the clash of hunting and herding cultures, or the politics behind animal importation. Wild caribou numbers plummeted toward the end of the nineteenth century, leaving lichen and new willow shoots ungrazed. The reindeer moved into these areas and ate themselves into abundance. Even with new introductions halted after 1902, the herds continued to swell. Other of the reindeer strayed and joined the caribou in the interior, breeding and creating genetic permutations of "reinibou" and "bouideer" and "reinicar" that the "carideer" managers could only imagine. While reindeer owners

mourned the loss of their stock, caribou enthusiasts worried that the hybrids would weaken the wild *tarandus*. At one point in the early 1930s, the domesticated reindeer in Alaska hit 650,000, stretching from Point Barrow on the Arctic Ocean to Unimak Island at the southern tip.¹¹

But eventually food became scarce as the reindeer were haunted by their domestic pasts. Both reindeer and caribou are dependent on “reindeer lichen” for winter forage, to take them through the harshest time of the year. The slow-growing lichen cannot withstand heavy grazing and require years to replenish. Not as migratory as their caribou kin and dependent on herders to urge them from one pasture to the next, the reindeer overgrazed. In addition, the reindeer were reliant on humans for protection from predators such as the wolf. As the herds swelled and opportunities for profit shrunk, people had neither the ability or interest to look after all of them. By 1950, the population crashed, dipping below 25,000 statewide.¹² Many starved and were left to decay. More recently, population pressure on the reindeer has come from another direction. As the numbers of caribou in the Western Arctic Herd rebound, they are competing with domesticated animals on the Seward Peninsula, making it difficult for reindeer numbers to grow to the huge herds Jackson imagined. Still, the circles of the missionary’s action continue to ring outward. Though the industry might not have converted the entire territory, on the Seward Peninsula and St. Lawrence Island, Native Americans herd 25,000 reindeer as part of a business worth \$1.6 million a year.¹³

Another aspect of the legacy of Jackson and his missionaries and teachers is even more clear. In Jackson’s photo album are several sets of “before” and “after” pictures, demonstrating the civilizing influence. In one series, five children taken from their homes near the Bering Strait stand

dressed in smocks of animal skin, fur hoods framing their faces. They appear dazed, hands dangling by their sides. One girl pulls her fingers up inside her sleeves, out of sight. In the next picture, after a year of school in Philadelphia, the four girls stand in black Victorian dresses that reach up to their necks and down to their wrists. Little bat wings of ruffles flare out from the top of each sleeve. Heads are exposed, hair parted in the middle. Hands clasp primly in each lap. The one boy holds a hat and silver buttons gleam down his front. They could almost belong in Minaville.

Similar transformations occurred throughout the country and the culture. Ironically, in some ways Jackson and his missionaries succeeded too well, civilizing and domesticating western Alaska until it resembled the very places they'd fled from when requesting some far-flung post. By the turn of the century, schoolhouses dotted the towns -- plain white buildings with flags flapping. Some had flower boxes in the windows where garden plants bloomed. Next to them stood churches, some with organs and proper altars. And down the street were houses with glass windows instead of skin, curtains tied back with pink ribbon, furniture of polished wood. And tablecloths, and china, and all the necessary things.

Swamp Riches

Early in the spring of 1939, a furry rodent with a hairless tail, webbed feet, and long whiskers curving down either side of her face gave birth to five young at the U.S. Fur Animal Field Station at the Blackwater National Wildlife Refuge in Maryland. The mother nutria looked like a mix of beaver, otter, and rat. Watching over her, Herbert Dozier, the director of the field station, weighed the squirming pups, noting that each stared at him with open eyes. Like an anxious new mother himself, he worried over how best to care for the litter, debating back and forth with his superiors in Washington, D.C.. Would the young nutria prefer carrots, fish, or protein pellets? Was their water clean enough? Should they plant kudzu in the marsh for the grown rodents to feed on? Director of the Fur Resources Division of Wildlife Research Frank Ashbrook offered advice and urged Dozier to keep his papers more in order.

That same year, Edward Avery McIlhenny lost a number of the nutria he imported from South America in 1937. They burrowed out of the enclosure where McIlhenny kept them on Avery Island in Louisiana and disappeared into the surrounding swamp. McIlhenny, known as "Mr. Ned," was both a shrewd businessman and an avid conservationist. Avery Island was rich enough in and of itself, being a natural salt mound, but to top it off one of McIlhenny's ancestors stumbled across *Capsicum frutescens*, a red pepper from which he created Tabasco Sauce. McIlhenny inherited the Tabasco business as well as the salt mines and split his time between running the company and creating wildlife refuges.

While the government scientists Dozier and Ashbrook documented their experiments with nutria with detailed explanations in letters and notes, McIlhenny was eccentric and wealthy and didn't have to justify himself to anyone. What exactly he wanted with the South American rodents is unclear. Whether he had profit on his mind when he imported the six pair of nutria or just wanted another addition to the menagerie remains a mystery of the bayou. The result is what people remember.

McIlhenny was a connoisseur of the exotic. His plant collection, dubbed "Jungle Gardens" and covering acres of his family estate on Avery Island, included species from all over the world: Egyptian papyrus, Japanese camellias, South Seas papaya. As a young man, McIlhenny ventured poleward in the mid-1890s and then put together his own ornithological collecting trip several years later. While in the Arctic from 1897-1898, he collected 1,408 bird specimens and carted hundreds of northern species to the East Coast to be analyzed. Admittedly, they were dead and could do little harm.

In the north, McIlhenny also witnessed the benefits of doing business in live exotics. He was at Point Barrow the year that the whalers were trapped in ice and housed and fed many of them during their long wait for rescue. As legend has it, the sailors employed themselves by making blankets out of the cotton McIlhenny brought to preserve his specimens. He also was there as Sheldon Jackson's rescue team of reindeer thundered into town, a little too late, and he must have heard the excitement surrounding this daring and charitable import.

Despite his attraction to non-native species, he was also aware of the damage they could do. At his beloved home on the Gulf Coast, starlings stripped holly berries, hackberries and chinaberries from the branches before the robins and cedar waxwings arrived. The raid prompted him to write an article entitled "Are Starlings a Menace to the Food Supply of Our Native Birds?", in 1936. For other lessons in the dangers of importing live animals, he didn't have to look farther than his bookcase. In his extensive natural history library, along with *The Natural History of the Bible*, *Beautiful Ferns*, and *Narrative of a Journey to the Polar Sea in the Years 1819-20-21-22*, he could delve into the Massachusetts State Board of Agriculture's exhaustive tome *The Gypsy Moth*..

McIlhenny also had a passion for the native species of Louisiana. In his free time, he might spend all day sitting behind a burlap blind on a box, observing a female alligator on her nest and taking notes. He made his name in conservation by creating a sanctuary for snowy egrets called Bird City. The plumage of the birds had been so in demand for hats in the 1890s that they were almost hunted into extinction. McIlhenny tracked down a few pair and raised them into a flock of thousands. One portrait shows him with the birds

that made his reputation. The egrets, perched next to him, flying behind him, and resting by the hundreds in the background, display elongated grace, thin black legs, the swoop of an S-shaped neck, the delicate spaces between curling feathers. Their thin beaks are like needles stitching a straight seam through the air. They soar and flap and fluff and preen. McIlhenny sits next to them in a heavy blazer, with a tie knotted just under the folds of his neck. Jowls round out his face, curving the lines from eyes to chin. His hair is brushed back off a dome-like forehead. His whole body tilts forward, gravity-bound. Every inch a business man, McIlhenny looks like he might rise out of the frame, clasp your hand in a meaty paw, and offer to sell you life insurance. But he pictured himself as a snowy egret.

That he envisioned this transformation, heavy bones traded for light ones, pink flesh for white feathers, is evidenced by his book *Autobiography of an Egret*. Inside, he takes the reader through life history of an egret living Bird City. His protagonist tells of the comfort of nestling in his mother's feathers and the anxiety of flying south for the first time. He is struck by love and lauds his mate-to-be: "Her deep lustrous eyes sparkled with the fire of youth. Her face was tinted with health, a delicate orange."¹ McIlhenny was a keen observer, and the book, like his others, *The Alligator's Life History* and *The Wild Turkey and Its Hunting*, is accurate in its detail if overwashed with emotion. The book has considerable appeal, though it ends on a self congratulatory note as the egret muses about McIlhenny: "When our tribe was at its lowest ebb, he gathered together the remnants and saved us from destruction. We cannot show our gratitude, but when all is over for me and I pass on to "bird heaven" I mean to whisper to the Keeper of the Gate, with all due respect to the One above, the name of the man who saved us."²

Humility was not McIlhenny's strong point.

With his Jungle Gardens and Bird City, McIlhenny was transforming the family estate into a haven for animals that needed his protection, stocked with biological riches from all over the world. His salt mound became a new Eden. And somehow nutria fit into this scheme.

* * * *

Whatever the Tabasco King was thinking, plenty of others looked at nutria and saw a fortune paddling through the swamp. In the wild, clumped with mud and dripping with water, nutria fur seemed as desirable as rat leather, but once the rough guard hairs were plucked out and the dirt rinsed off, the underfur remained soft and silky. Furs were the rage in the 1920s, when many could afford mink stoles and raccoon coats, and lingered in popularity in the 1930s, when they symbolized the glamour that for most was out of reach. The clamor for different species to turn into wraps and capes made coveting the hair of a South American rodent seem perfectly ordinary. Much weirder things were going on.

The variety of animals used for fur at the time could fill a zoo. Magazines displayed marmot jackets, beaver collars, and wolf fur wraps. Men and women draped themselves in mink, ermine, silver fox, raccoon, sable, muskrat, lynx, Persian lamb, chinchilla, ocelot, leopard, panther, monkey, skunk, kangaroo, mole, opossum, otter, gray squirrel, seal, wolverine, rabbit, bear, weasel, wombat, and goat. Other species making the catwalk were unknown to zoologists: glutton, breitschwantz, and marabou. Every creature that had devised a way of keeping warm in the winter was pursued with trap

and gun.

But the furrier's hunger was hard on wild animals, and entrepreneurs began to search for a way to supply the market without relying on prey that was growing more and more scarce. While fur trapping had been a mainstay in the United States since the first beaver crawled ashore in sight of a white man, fur farming on a commercial scale only emerged at the start of the 20th century. In the 1890s on Prince Edward Island in Canada, fortune seekers captured and began breeding a red fox with a rare fur color--silver. No one paid much attention until the company released sales figures for silver fox to the public in 1910, triggering the Great Fox Rush. A single Prince Edward Island pelt had sold for \$2,627, and it wasn't long before investors would pay \$35,000 for a breeding pair.³ By 1922, the United States government had leased 150 Alaskan Islands for fox farming.⁴ Mink ranching didn't get underway as a sizable business until the 1920s. An article in *The Illustrated London News* under the subtitle, "A ten-inch rodent with a fortune on its back," told the story of a Mr. Chapman who traveled to 11,300 feet in the Chilean Andes in order to trap twelve chinchilla to start his fur ranching operation. He carried them back, panting from the heat, in a special refrigerated compartment. Mr. Chapman, grinning with a mouthful of bad teeth and looking like he really, really needed this scheme to work out, posed for the magazine with one of the precious rodents perched on his head.⁵

Fur farming solved so many problems. No longer would trappers be dependent on fluctuations of wild animal populations. All an investor needed to do was import the right exotic species or domesticate a native one, build a cage, hit on the right type of food, and the money would roll in. France imported silver fox and opossums. Germany, Switzerland and Russia

sought nutria. England brought in the muskrat. It was like a gold rush with a guaranteed lucky strike or a lottery ticket with a tip-off on the winning numbers.

In the early 1920s, Fur Resources Division Director Ashbrook himself wrote an article on the growth of fur farms in the United States. Soon it seemed as if anyone who had a fenced patch of ground in their backyards and not much else to their names, wrote to him asking about breeding nutria. As a result, Ashbrook and Dozier's experiments in Maryland had a twofold purpose: the first was to learn whether farming nutria for fur could be profitable. The second was to determine if setting the rodents free in the marshes would provide a windfall for trappers. Throughout 1939 and 1940, the fur operation in Maryland continued to grow. They bought more nutria, guaranteed to be of the finest South American stock, from a dealer in Canada and requested several more from the Bitter Lakes Wildlife Refuge in New Mexico, where a local population of fur farm escapees flourished. Dozier continued to care for the growing pack, tenderly noting each birth, feeding the newborns from eyedroppers, assuring Ashbrook after a litter of eleven, "the mother is doing nicely."⁶ And Ashbrook wrote back, encouraging Dozier in his work and chastising him when the government inspectors came by the station and found beds unmade.

At the end of July, 1940, Ashbrook sent a prepared nutria pelt from the Bitter Lakes Wildlife Refuge to a fur merchant for appraisal. The reply came back that the skin was worth \$2.25, not a bad price, but certainly not enough of a profit to sell the ranch for a pair of nutria in the hopes of buying a mansion. The answer to Dozier's -- was breeding nutrias profitable?-- would seem to be "no." As Ashbrook pondered this news in D.C., maybe drafting the next

discouraging series of letters to nutria enthusiasts, down in Louisiana they were keeping an eye on the weather.

The forecasts for Sunday, August 4, called for cloudy skies and occasional thundershowers, but with a such a strange summer, who knew what to predict? July broke records for both heat and cold, topping out in the high 90s and plunging to the low 60s. Visitors lingered at Gulf Coast resorts, watching the skies and hoping for sun. Determined weekend gardeners braved the damp to plant sweetpeas and zinnias. Others holed up in movie theaters to lose themselves in *They Drive by Night* with Humphrey Bogart or *Young Tom Edison* with Mickey Rooney. Meanwhile, high winds picked up off the coast of western Florida.

On Monday, society matrons prepared for a slowing of summer activities. The governor went to Washington to extract promises of aid for farmers whose crops suffered rain damage. The National Guardsmen slogged through drills in the mud and drizzle. To the east, in Mobile, Alabama, winds up to 35 miles per hour buffeted cars. Tides in Mississippi crept down the shore while barometers recorded unusually low pressures. And 225 miles out in the Gulf, the Greek freighter *Oropos* sent out a distress call.

Overnight, Louisiana learned this was more than just bad weather. A tropical storm careened the along coast, wrecking whatever it touched. Wind and water blew out piers. Waves lapped up the steps of the seawall and slipped under doors of houses built seven feet off the ground. Gusts ripped through powerlines and sent awnings crashing through shop windows, mixing glass with merchandise. Rain streaked the new rosebud wallpaper of a dance club as a duck paddled by the piano. As the bayou flooded, trappers fled their homes, clutching a hat or a sack of rice. Muskrats, trapped by high water

in their nests, had nowhere to go, while deer fled for high ground. By Wednesday morning, newspapers called it a hurricane as 95-mile-per-hour winds roared over the Louisiana-Texas border.

At the height of the storm, flooding closed highways, drowned muskrats and cattle, and forced many to flee to shelters set up by the Red Cross. The southern part of the state was deluged.

After the hurricane passed, the Oropos made it to shore with a patched rudder and everyone prepared to go home and start the work of cleaning up, but the rains didn't stop. For days the downpour continued, as if the clouds, fury spent, exhaled a long damp sigh of relief. Highways closed, living rooms flooded, and refugees trudged by the hundreds to high ground. Red Cross volunteers gathered food and clothing.⁷ On Avery Island, the rain began to fill the pen where McIlhenny kept his remaining nutria. Dirt turned to mud, which changed to murky pools. Drops splattered on the nutria's eyes and snouts, running through their fur and soaking them from above, while the building flood lifted 150 of them from below. Soon their paws no longer touched the ground. They swam. The rushing water carried them, slick and buoyant, lifted them to the edge of the boards stacked one against another to make a fence, and washed them out over the land.

While many other fur-bearers would have drowned in the flood, the nutria found itself in its element. If one, maybe a female, found itself swimming in the swamp, webbed hind legs and a flat hairless tail would let her navigate to a good spot on the shore. Thick brown fur, coated with oil that made it shiny would keep her warm, even in ice-lined channels. But in a Louisiana August, she had no such problems.

As the rain eased and the swamp drained, she found herself in ideal

habitat. Her food was the substance of the marsh itself. Strong front teeth, notably orange, gnawed at pickerelweed, bull's tongue, arrow head, and squarestem spikerush. After harvesting a plant, she brought it back to a chosen spot -- a floating log or branch -- to eat away the roots and tender sections, and leave the rest in a scrap heap which grew through time.

Her nest, a simple affair of sawgrass or cutgrass, was probably in a cattail stand. Four and a half months after mating, she gave birth to a litter of fur-covered pups, ready to follow her into the stream hours later. Even while she was underwater, they could nurse, as her teats lined her back, several inches on either side of the spine. In four to six months, these offspring would be able to breed as well.

As the weather dropped below 40 degrees Fahrenheit, preparations changed. Digging into the mud on the side of the bank, she carved out a burrow ending in a chamber about five feet in and above the waterline. Lining it with vegetation to keep out the winter cold, she created a space that generations would return to, each adding to the underground network.

While she nibbled and dug and nursed her young near Avery Island, other nutria were doing the same throughout North America. McIlhenny's importation wasn't the first. Encouraged by Stanford University President David Starr Jordan and the U.S. Biological Survey's C. Hart Merriam, Will Frakes brought a male and three females to Elizabeth Lake, California, in 1899. There is no record of whether or not they increased, but others would soon follow. In Canada, C.R. Partik received some from a friend in Germany in 1928 and he raised them through Quebec winters in outdoor pens. Ten years later, the *Fur Trade Journal of Canada* published a pamphlet called *Nutria Raising*, encouraging others to go into the fur farming business. And they did.

Other accounts describe nutria in Washington, Oregon, and Michigan in the early 1930s and New Mexico in the mid-1930s.

Wherever else nutria talents might lie, they are master escape artists. All over the country, stories similar to the Avery Island release surfaced. In 1941, orange-toothed swamp creatures showed up along the Sammamish River in Washington State. This strange beast puzzled locals until they made the link to nutria fur farms that had shut down in Seattle, Bothell, Bremerton, and Bellingham. Other feral populations appeared in La Conner, the Colville Indian Reservation, and Portland, Oregon. In the Bitterroot Valley of Montana, an irrigation ditch breached in 1944, washing away nutria kept for breeding there. Two years later, mystified trappers hauled in several. Back in Maryland in 1943, nutria escaped from Dozier's enclosures at the Blackwater National Wildlife Refuge. In following years, residents found winter-killed nutria under their cabins, and eventually several thousand roamed wild around the experiment site. Not all the releases were the result of nutria ingenuity, however. During World War II, fur's popularity disintegrated, and many former fur breeders set their unprofitable investments free. Despite these introductions, promotions, and escapes, nutria hadn't gotten loose in such large numbers in such suitable habitat before 1940. The nutria took to the Louisiana swamp like mosquitoes to standing water.

Five years after the August hurricane, trappers took 8,786 nutria from Louisiana marshes. The next year, they pulled out 18,015.⁸ By 1961, more than one million nutria were chewing up sawgrass, flattening cattails into nests, and digging burrows into the channel banks.⁹ McIlhenny, by accident or design, had reshaped his home state.

Once the nutria were scampering through the marshes in ever more abundant numbers, no one knew quite what to make of them. True, they plowed into rice field levees to make burrows and chewed up crops of sugar cane, sweet potatoes, and cabbage. Cows tended to wander over tunnels they'd dug and fall through, while muskrats, already under pressure from developments that swallowed their salt marshes, didn't need the competition. But nutria also gnawed at undesired plants (and desired ones, as those who tried to employ them as weed cutters soon discovered), and offered a new source of fur for trappers. In addition, their meat could be sold as mink food. And, when looked at in the right frame of mind, they were kind of cute.

This ambivalence showed up in state decrees. Shortly after their release, in 1946, Louisiana protected the newcomers as valued fur bearers. But by 1958, the nutria had eaten their way into "outlaw" status in certain areas, a position which allowed them to be killed indiscriminately. By, 1963, 17 parishes deemed the nutria an outlaw, but the next year, they were protected fur bearers again throughout the state.¹⁰ Economics undoubtedly played a role, as in 1965-66, nutria pelts from Louisiana brought more than \$3 million dollars to trappers in the swamps.¹¹ No wonder the animal had so many names. Known as nutria or coypu (when reported on in newspapers), *Myocastor coypus* (when referred to by scientists), rangodin (when served for dinner), castorino (when draped as a fur), or "varmint" (when nibbling at sugar cane), the rodents tugged at heartstrings, purse strings, and trigger fingers. They were introduced to new areas constantly, while at the same time hunters would build rafts, litter them with carrot chunks, shine a light out over the marsh, and open fire at the first paw that reached up after the bait, just for the heck of it.

In the 1950s, even as nutria became more and more available to anyone willing to trek through the cattails to set out a trap, nutria farming surged again. At first it didn't seem such a shady business. While not as popular as sable or beaver, nutria fur did show up in stores and magazines. Designers occasionally offered a sweeping nutria coat that dropped down below the knees, a nutria overcoat with pony skin collar and cuffs, or a plush brown travel coat with side slits and a tapered back of dyed beige nutria. Other breeding operations, such as mink and silver fox, had been subject to wild speculation at the beginning, but had settled down into legitimate business enterprises. This was the promise dangled before prospective investors.

Organizations multiplied like the nutria themselves. The Superior Mutation Nutria Organized Ranchers, Purebred Nutria Associates, Inc., International Nutria Marketing Association, Cabana Nutria Inc. (whose logo featured a big-toothed rodent wearing a crown over the words "sign of quality") all recruited new members. Slick brochures featuring women in ankle-length fur coats and white gloves assured investors one nutria pair would produce 600 pelts 39 months after purchase (small print: if each female gives birth to 15 young a year) and offered hopefuls \$18,000 annually (small print: if each pelt sells for \$30). Ads in the back-of-comic-book style hinted at annual earnings up to \$50,000. And even if the furs didn't bring top prices now, promoters glowed, just wait until nutria color mutations hit the market. Black, white, sand, pastel, and champagne pelts would soon sweep away the plain old brown.

But nutria fur had its problems for would-be breeders. Preparing the pelts was time-consuming and expensive, pushing their cost into the luxury category, while the quality of the furs couldn't compete with mink and

chinchilla. During the 1955-1956, the average pelt sold for \$1, making nutria hardly worth trapping, much the less paying to feed and house them. Unlike many other fur-bearing species, nutria were increasing, not decreasing in the wild, so farming them didn't make much sense. As far as pricey mutations, the National Better Business Bureau commented, "It is pertinent at this point to note that a natural brown nutria can be plucked, bleached, and dyed any color of the rainbow for a few dollars."¹²

As long as the hype swelled, nutria breeders could profit by selling nutria to other entrepreneurs at dream-fueled prices. Some breeding pairs went for as much as \$2,500. It was a grand pyramid scheme, a game in which he who took his pelts to market lost.

Twenty years after Ashbrook sent the nutria pelt to his furrier friend for evaluation, he was getting the same questions in the mail. Can you send me information on raising nutria? Where can I get some? How much are pelts worth? Do you have statistics on mutations? And Ashbrook would dutifully send a fact-laden and cautionary reply. Finally Ashbrook's measured tone gave way to a burst of frustration. In a pamphlet for the National Better Business Bureau, he wrote:

The epidemic of booms and busts has been breaking out ever since fur farming began and still persists; silver foxes, muskrats, minks, chinchillas, and nutrias have all experienced a series of these outbreaks. Through the years some legal action has been taken against the unscrupulous promoters of fur animals, and in some cases the fakers have been restrained by court order from staying in business. But by and large they have continued to flourish. Just so long as people are gullible and willing to be victimized, fur farming ranches will continue. It is an appalling fact that in spite of many years of study, research, and promotion of legitimate fur animal production, and utilization of furs,

this get-rich-quick skin game can be perpetrated on the American public. Must history always repeat itself?¹³

No one listened, but the legal action Ashbrook hoped for finally arrived. In 1960, Cabana Nutria ringleaders were indicted for mail fraud. They received less than a slap on the wrist, more like a love pat: suspended sentences and \$1,000 fines. Cabana Nutria went bankrupt, but year and a half later the company was back in business--new name, same board of directors.

As fur declined in popularity in the 1990s, nutria populations grew and earlier ambivalence toward them turned to plain dislike. Because nutria prefer tubers, they rip up the matted roots that support banks and shorelines, promoting erosion and damaging already scarce wetlands. Marsh turns to open water. Their increased numbers only made the problem more acute. In response, the Louisiana Department of Wildlife and Fisheries sponsored nutria cookoffs, hoping that a public appetite for nutria chili and nutria sausage would keep the offspring of McIlhenny's imports down to a controllable level. The U. S. House of Representatives recently passed legislation that would provide the Blackwater Refuge in Maryland with resources to go after its nutria, hoping to eradicate Dozier and Ashbrook's legacy for good.

Today nutria is still classed as a cheap fur, ranging from \$1,995 to \$6,000 for a coat, compared to the more upscale chinchilla whose price ranges from \$30,000 to \$100,000.¹⁴ But the modest returns don't stop big dreamers in new areas from pursuing their potential. While chefs in Louisiana perfect their nutria pate champagne, farmers in Thailand and Slovakia are experimenting with nutria raising, trying to produce larger pelts, angling for durability and

shine, hoping for a kind of alchemy that will breed luxury from all their spare dirt.

Bonus Round: Kangaroo on the Plains

*“What’s done we partly may compute,
But know not what’s resisted.”¹
--Robert Burns*

In these times of spotted knapweed erupting like a lavender rash, Asian longhorned beetles tattooing tree bark, and starlings booting cavity nesters out of every desirable hole, it’s easy think things are as bad as they could be. It’s easy to forget to be thankful for all those exotic species that couldn’t adapt, failed to breed, missed the boat, or, for whatever reason, just never quite made it.

The kangaroo, for instance.

In 1892, Robert C. Auld, a Scottish cattle breeder who lived in the Midwest, noticed the buffalo were growing more scarce than whisky at a

temperance meeting. With the herds gone, vast reaches of prairie stood empty; acres of grassland--wasted. What the West needed, he suggested, was a new large ruminant to take its place. The kangaroo would be perfect.

Auld considered all the angles. From shapely ear to hefty hind leg, the kangaroo exuded potential. Hides went for \$5 to \$7 a dozen. The fur wrapped the shoulders of the fashionable. The tails made tasty soup. Sportsmen could save the cost of the fare to Australia and cull trophies from their own backyards. But his vision didn't stop with the creature as an expensive curiosity. "There may come a time when it may become more profitable to raise kangaroo than even cattle on the 'arid' ranches,"² he wrote.

His Australian connections assured Auld that the operation would be easy and cheap. They suggested the great gray kangaroo and the swamp wallaby for maximum profit and noted the kangaroo could eat whatever cows disdained and should have no trouble with the North American climate. Both males and females were reputed docile and easy to handle. The only expense would be fences. High ones, of course.

* * * *

That was a narrow miss, no doubt. But it's easy to picture what might have happened. The story is sadly too familiar. It could have been something like this:

The first kangaroo were welcomed, greeted in at railroad stations by banner newspaper headlines and nervous professors reading long speeches. As they hopped tentatively from their crates, the crowd sent up a cheer. The fashion that year demanded mothers carry their babies in beige dresses with

crocheted front pouches. Towns renamed themselves: Kanga City, Joey, and Rooville. Fortune-hunters sunk life savings into buying one or two breeding pairs.

After three months, though, the blush was off the rose. One swift kick or high leap dispatched the rancher's fences, and the kangaroo roamed the plains in feral bands, harassing the antelope. They proved more fruitful and hungry than Auld imagined, turning lush fields into stubble. Elk that shared the same habitat began to look a little thin. Dresses with pouches flooded thrift stores. Rooville voted to go back to being Copper Town. All the leggy young men hired on as kangaroo ropers drifted off in search of other work. Meanwhile, the kangaroo ate and bred and hopped and proved what Australian sheep farmers always knew: they're pests.

One day, when kangaroo had become common as grasshoppers, decades after people forgot they were non-native, news arrived which shocked the region. A reclusive botanist had sent pages of research notes written out in longhand to a premiere scientific journal, observations based on years of wandering meadows where the kangaroo grazed. Seeds of the rare coulee-dwelling trembling wallflower proved unable to germinate in the compact soil resulting from the bounding herds. The few that did struggle through the earth were quickly chewed up as the exotics found the young shoots a delightful snack. The species perched on the edge of extinction.

Then the real controversy began. Kangaroo enthusiasts who'd grown up loving the gentle hop, hop, hop of the animals as they nibbled tender broccoli buds from the garden at dusk sent haiku and Shakespearean sonnets to their governors. Father and son duos offered gruff testimony about the thrill of hearing the boomer's warning thumps at their approach and the joy

of celebrating a successful hunt with savory kangaroo medallions. The bartender at Hopper's and the owner of the microbrewery Big Tail Pale Ale overcame their differences and co-wrote an impassioned letter to the editor about the shortage of good mascots these days. Meanwhile, the anti-kangaroo factions declared them noxious weeds, refused to refer to them by any other term than "the invaders," and demanded every last one be shot (and drawn and quartered for good measure).

State and local legislatures earmarked hundreds of thousands of dollars for kangaroo control measures. A brave zoologist ventured into the field with ten thousand packets of birth control pills and a prepared explanation, never to be heard from again. When government scientists brought the dingo over as a biological control agent, voles, marmots, ferrets, snowshoe hares, and miniature dachshunds vanished from Sioux City to Spokane. And still the kangaroo numbers continued to grow. In the swell of a population explosion, with the range grasses depleted, they stumbled into towns only to find kangaroo-proof Astroturf lawns, installed by federal mandate. There they collapsed on the sidewalk, where the postmaster tripped on the destitute creatures. It would have been ugly, no doubt.

* * * *

But despite the solid reasoning of Auld's plan, no popular upsurge demanded marsupials for Montana. Maybe funds were short. Maybe will was lacking. Maybe it just wasn't the right time. Eventually, Auld turned away from ranching and moved to New York to become a newspaper journalist. In later life, he studied up on the Scottish poet Robert Burns, wrote a book called

The Robert Burns We Love, and served as founder and general secretary of at the Robert Burns Memorial Association. The kangaroo scheme fell by the wayside.

So even though the West may seem overrun, invaders pawing at the gates and taking root under them, rest assured that it could have been worse. While pondering that useless patch of ground, breeding nothing but bunchgrass and prairie dogs, think of what could have been. Then send up a small prayer of gratitude for whatever quirk of fate kept the prairies kangaroo-free. At least for the time being.

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