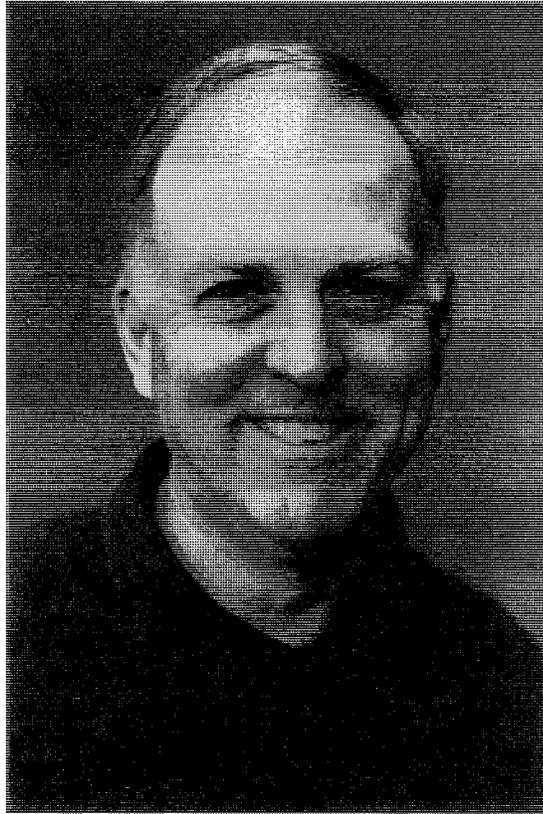


FOURTH E.V. KOMAREK, SR. MEMORIAL FIRE ECOLOGY LECTURE

STRANGE FIRE: THE EUROPEAN ENCOUNTER WITH FIRE

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ABSTRACT

Fire on the Earth today looks the way it does because of the expansion of Europe, first as an imperial power, then as the vector for industrialization. The “suppression” paradigm characteristic of Europe’s frontiers derived from the collision of intra-European experiences with extra-European environments.

While the narrative of European fire is complex, in general it tells the story of fire embedded in agriculture, controlled by close cultivation and careful burning; of fire practiced by peasants and condemned by urban intellectuals; and of institutional arrangements, forged in the Enlightenment, by which modern science interpreted fire and forestry and sought to control it. Still, even in central Europe, forestry could no more evade controlled fire than could the rest of European agriculture.

In its colonies, however, Europe was able to impose institutions radically different from those known in its cultural hearth. Public land reserves created an alternative paradigm to the garden. Fire protection became more adamant on lands vacated of residents. With industrial combustion, it seemed possible, by substituting the burning of fossil fuels for biomass, to transcend the endless cycle of fire and fallow that had governed European experience.

Paradoxically, the Europe that promoted fire suppression was also responsible for creating the environments that free-burning fire now preferentially inhabits.

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INTRODUCTION: THE LABORS OF LINNAEUS

In 1749 Carl von Linné was at the height of his fame. He was professorially ensconced at Uppsala and popularly enshrined as a “second Adam” who had named all the plants and animals of the world. He was celebrated for his travels throughout Sweden, especially Lapland, and renowned as the author of *Systema Naturae* and other classics of natural history written under his Latin nom de plume, Linnaeus. So it was natural that King Frederick I should invite him to tour Sweden’s most southerly lands, Skåne, that Linnaeus should agree, and that he use the occasion to return through Småland, his home province. There Linnaeus studied the contentious subject of *svedjebruk* (Swedish swidden, a form of primitive agriculture) “looked upon by some as profitable, by others as rather deleterious.” So prevalent was the practice that some Linnaean contemporaries believed Sweden had derived its name from the endless cut and burned blocks (*svedje*) that comprised its countryside (Figure 1).

Pondering the evidence, Linnaeus concluded that, while fire unquestionably consumed humus (“the food of all growth”), the practice allowed farmers to get “an abundance of grain [‘and for several years . . . a good pasture of grass’] from otherwise quite worthless land.” Deny them that burning and “they would want for bread and be left with an empty stomach looking at a sterile waste . . . a thankless soil and stony Arabia infelix.”

The passage, however, outraged Baron Hårleman, high commissioner of agriculture, and Linnaeus was forced to delete it from the final publication. “Not only,” Hårleman fumed, had Linnaeus “not condemned *svedjebruk*, as pernicious for the country, but even contrary to his own better judgment justified and sanctioned the undertaking.” In penance, Linnaeus was compelled to insert a long passage on the value of livestock manure as a way to supplement traditional forest composts of heather, moss, and conifer needles. Even in High Enlightenment Europe, it seems that burning could not compete with bullshit.¹

The labors of Linnaeus tell us a great deal about European fire, about the extent to which it was embedded in the social matrix of agriculture, and hence why it looks invisible to those, like Americans, to whom fire is recognizable only when it free-burns in wildlands. Europeans cannot imagine fire outside that social order. (Americans, by contrast, struggle mightily to extricate fire from its cultural context so that, like physicists contemplating ideal frictionless surfaces, they can study its pure properties.) But the incident also matters because Europe has influenced the fire history of the planet more than any other continent or civilization.

Fire on Earth looks the way it does today because

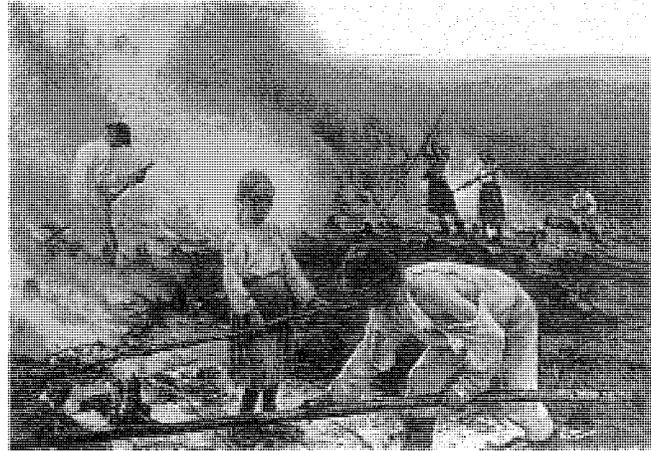


Fig. 1. Eero Järnefelt, *The Wage Slaves (Burn Beating)* (1893).

Swidden cultivation (*svedjebruk*, Swedish; *kaski*, Finnish) in Finland, much like that described by Linnaeus for Småland. Boreal swidden was part of a complex choreography of land use. The painting shows a second-order swidden (what was called “circulating *svedjebruk*”) mostly in second-growth conifers and birch. Note the special clothing, hats, and shoes worn. The reason for the haunting look on the young girl (and the title) is that this group no longer owns their land but works as migrant swidden laborers.

The European critique of fire, however, has always been embedded within a social context. That swiddeners moved—that fire practitioners tended to cycle through landscapes—repeatedly alarmed authorities. Controlling fire would control land use, which would shape the social order. Reproduced courtesy Ateum Museum, Helsinki.

Europe expanded beyond its constricting peninsulas and islands to become a global power. Because it transferred to that overseas imperium an industrial revolution that could, by exploiting fossil hydrocarbons, transcend the endless ecological cycles of its agricultural heritage. Europe has influenced fire in Asia, Africa, Australasia, and the Americas in ways that none of those places have influenced European fire. From Europe’s ancient association of fire and agriculture came conceptions of fire’s proper place in the landscape. From Europe’s alliance of forestry and imperialism came the attempt to suppress fire in large forest and wildlife reserves that were created in overseas colonies. From Europe’s industrialization came the apparatus to enforce the agenda of fire abolitionists. It is no accident that the continued condemnation of fire by international environmentalism—from nuclear winter to greenhouse summer, from fire as emblem of social disorder to fire as a perverter of biodiversity—has its origins in Europe. Europe’s fire has become, as Europe always believed it would be, a vestal fire for the planet.

AN ENDLESS CYCLE: FIRE AND FALLOW

Before there was a Europe, there was fire. But as the last of the Pleistocene glaciations receded, that fire

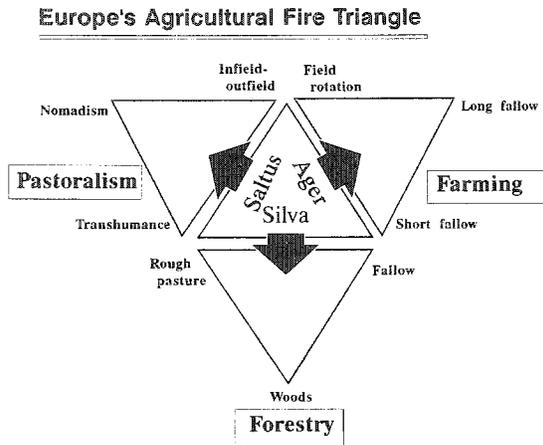


Fig. 2. Europe's Agricultural Fire Triangle.

European agronomy divided into three interdependent parts: ager, the cultivated field; saltus, the rough pasture; and silva, the woods. Utilization of each depended on fire, according to some regime. The fire, in turn, required fuel, which came from the temporarily abandoned sites and was known as fallow. For centuries agronomists sought to reduce and ultimately abolish fallow, and with it, fire. This became possible only with recourse to the fossil fallow of coal and petroleum, combusted or distilled in special furnaces.

was anthropogenic. Increasingly, it was prescribed by the imperatives of the Neolithic revolution. The hominid colonization of Holocene Europe was a flame-catalyzed reclamation by agriculture. Over long millennia, livestock and cultigens, tended by fire-wielding humans, penetrated into every valley, propagated up every slope, and prevailed over every alternative biota. The social order dictated the biotic order. Europe became an immense garden.

There was no lack of fire. In Mediterranean and boreal Europe, agriculture replaced one fire regime with another. In central Europe—the temperate core of the continent—the Neolithic revolution vigorously expanded the dominion of fire. Here agricultural colonizers shattered the biotic belljar of shade-lording limes and elms and concocted a biotic stew that simmered over a succession of landscape-cooking fires. Fire cleared new fields, fire renewed old ones, fire flushed pastures, fire stimulated forbs and berries and pharmaceuticals suitable for foraging. Fire established the garden; fire cleaned it periodically; and fire powered the dynamos of its nutrient cycles. Without fire much of Europe was uninhabitable. Practitioners never doubted this fact.

Europe was a dense miniature of landscapes and peoples, and the geography of its fire reflected this complexity. Yet all Europe's agricultural systems, excepting (with qualifications) irrigated croplands, were variants of fire-fallow farming practices. Some land lay fallow for a season, some for one year out of a handful, some for decades while cropland succumbed to rough pasture and then to woods. There is no good name for this collectivity of fire-rekindled fallowing. *Swidden* is the common anthropological expression, but when it was introduced to the literature to describe East Asian practices in the 1950's it was greeted with

disdain (and dismay). Critics like H.H. Bartlett preferred indigenous terms, of which there were dozens. Why, he asked, accept for the Philippines and the East Indies an antiquated expression drawn from Viking-colonized Yorkshire to describe the burning of the ling? In 1958 the word remained so obscure that it was not even recorded in the *Oxford English Dictionary*. But the term triumphed, anyway, a metaphor for the ascendancy of European concepts throughout the globe. It seems only appropriate to have it apply, with all its faults, to Europe itself.²

Its fallows, like its poor, were always among Europe's farmlands. Intellectuals hated it. With few exceptions—Vergil, Linnaeus, a handful of others who had grown up on farms—professional agronomists, all trained in cities and housed in academies and bureaus, detested the fallows as a waste of productive land and an invitation to sloth. Worse, the fallows were burned. For a civilization constantly pushed to (and beyond) its demographic limits, haunted by visions of famine and hunger-driven disease, the flaming fallows were unconscionable. The “disgrace of the fallows,” as Francois de Neufchateau declared in the 18th century, obsessed agricultural intelligentsia and officials. Why did they persist? Why could they not be utilized instead of being sacrificed to the faithless flames? Why could not cultivation proceed to the point that it dispensed with fire altogether?³

There was no single reason. But agronomists had the relationship reversed. Fire did not follow fallow as plague did rats. The burning was not a convenient (if, to official eyes, indolent and reckless) means to dispose of agricultural trash. The fallows were grown to be burned. They were cultivated to support fire just as three-field rotations grew oats and barley to feed draft animals. Fire was integral, not incidental. Agriculturalists relied on plants to recapture nutrients and then burned them to liberate those biochemicals in a suitable form. They needed to jolt fields back to life, needed to purge soils temporarily of hostile microorganisms and weeds, and needed to flush stale pasture with succulent proteins. Fire alone did this, and in order to burn, fire required suitable fuels; these were grown. Even constantly cultivated infields required outfields from which to gather combustibles or to run the herds from which, housed in winter barns, manure could accumulate. Those outfields were swiddened and their rough pastures burned (Figure 2).

Fire and fallow constituted an endless cycle, sometimes swelling outward, sometimes contracting, but never broken, that informed European agriculture and through it shaped the European landscape and informed a European land ethic (Figure 3). Where officials saw environmental and social wastage—lost revenues, wandering swiddeners and pastoralists, incinerated soils, scorched timber—peasants saw renewal, and their fire ceremonies clearly spoke to the dual virtues of fire to purge the bad and promote the good. Fire was as essential to the farm as to the household, a tool more indispensable than plows and harrows. By contrast, an urban intelligentsia experienced fire in cit-

ies and identified it with social disorder, especially war. Intellectuals denounced; peasants burned.

The official protest did have its logic. However much agriculture reshaped landscapes it could not, ultimately, make something out of nothing. The prevailing understanding of nature was that it was profoundly cyclic. Growth and decay were exquisitely balanced. Since the Creation no species had been added to or subtracted from the Great Chain of Being. Agriculture required that no more could be removed from a field than had been previously put into it. Productivity could only increase by building up the reservoir of soil nutrients. Failure to return as much as was harvested led to degradation, of which there were endless examples. In this Newtonian ecology, landscapes orbited with a biotic balance as delicate as the one that planets traced between gravitational and centrifugal forces.

Each group perceived the central fire differently. What farmers saw as an informing sun, agronomists saw as a flaming ball and chain that shackled civilization into a rural rut and prevented any hope of improvement. That fire burned away humus was thus sufficient cause to criticize it. That fire promoted wasteland and fallow was enough to condemn it. Fire took away: it did not give back. The transmuting fire was, to critics, a kind of folk alchemy, proposing to turn environmental lead into agricultural gold. Folk fire practices seemed no better than superstition, a ritual with no more substance than ancient fire ceremonies that burned witches and heretics. For millennia, fire traced the great divide between "rational" and "primitive" agriculture.

Nature's economy was inseparable from society's. It did not help fire's cause that within a landscape like Europe's shaped by human artifice, wildfires appeared most prominently during times of social breakdown. War, revolution, famine, pestilence—anything that left the garden untended would let fallow run riot and would end, like peasant rebellions, in torch and sword. Society and land were both bound by the same inexorable logic; and fire threatened each.

Even the lordly Linnaeus could not escape, nor wished to. The same year that he toured Skåne, he published his widely influential essay, *Oeconomia Naturae* ("The Economy of Nature"), in which he conveyed the exquisite checks and balances that informed nature's polity and that equally governed cultivation. The theme obsessed him. In his last, brooding essay, he pondered the character of divine justice by which every deed had, with almost Newtonian logic, its retribution.⁴

But there was no doubting fire's presence and power. When Linnaeus was still a youth, Herman Boerhaave had declared that "if you make a mistake in your exposition of the Nature of Fire, your error will spread to all branches of physics, and this is because, in all natural production, Fire . . . is always the chief agent." Europe's agricultural systems orbited around that central fire. Even long hunters in Finnmark, transhumant pastoralists in the Apennines and Pyrenees, and Slavic swiddeners in Siberia were

caught in its ecological field like swarms of biotic comets.⁵

EXTENDING THE CYCLE: ENLIGHTENMENT AND EXPANSION

But if Linnaeus could not escape, his Apostles—the 12 students he dispatched around the world—could. Symbolically, they extended the circle of the European Enlightenment, and with it a dynamic of exploration and empire that established a European hegemony not only in the world's political economy but in its scholarship. That propagating periphery was all too often a frontier of fire.

Europe reconstructed how it thought about the world, and it began rebuilding the world accordingly. Intellectual Europe increasingly accepted modern science as the model of knowledge, and it enshrined progress, not renaissance, as nature's informing principle. Imperial Europe renewed rivalries on a global scale in what William Goetzmann has termed a Second Great Age of Discovery. Overseas outposts moved beyond trading factories on the coast and probed boldly inland, repopulating landscapes with European emigres, remaking foreign lands into a constellation of Neo-Europes, a colonial outfield to the metropolitan infield. Industrial Europe, building on a century of agricultural reformation, experimented with an economy no longer circumscribed by humus, manure, and sunlight.⁶

Carrying the Torch: New Lands, New Fires

The Maoris, the Malagasy, the Madeirans—all have founding myths of a great fire that accompanied settlement, and the record of such fires is buried in their soils and lakes. Similar contact fires have left comparable records in Brazil, Iceland, and Australia, everywhere that had colonizing peoples and the means to preserve charcoal. That imperial Europe should also have its world-transmuting fires is no surprise. Everywhere the strike of European steel on indigenous flint threw sparks to all sides. Forested frontiers, in particular, were a flaming front full of eruptive fires with names like Peshtigo and Miramichi that left behind a landscape of more subdued, residual combustion.

And fire *did* remain, sometimes a cause of these immense changes, often a consequence, but always a catalyst. In places, colonization expanded fire by transferring European fire practices to receptive landscapes, or by breaking down old biotas and reconstituting them with Eurasian surrogates. So swidden exploded out of New Sweden across the American backwoods frontier. Sheep swirled around the gyre of Australian grasslands. Livestock crushed the once-grassy deserts and savannas of the American West and the south African veld. The exotic fauna soon spread exotic flora from wild artichokes to cheat grass to tumbleweeds, and fires rose and fell with the strength of these biotic tides. Elsewhere, colonization sought to contain indigenous fires, or to abolish them.

Ultimately, settlement exchanged one fire regime

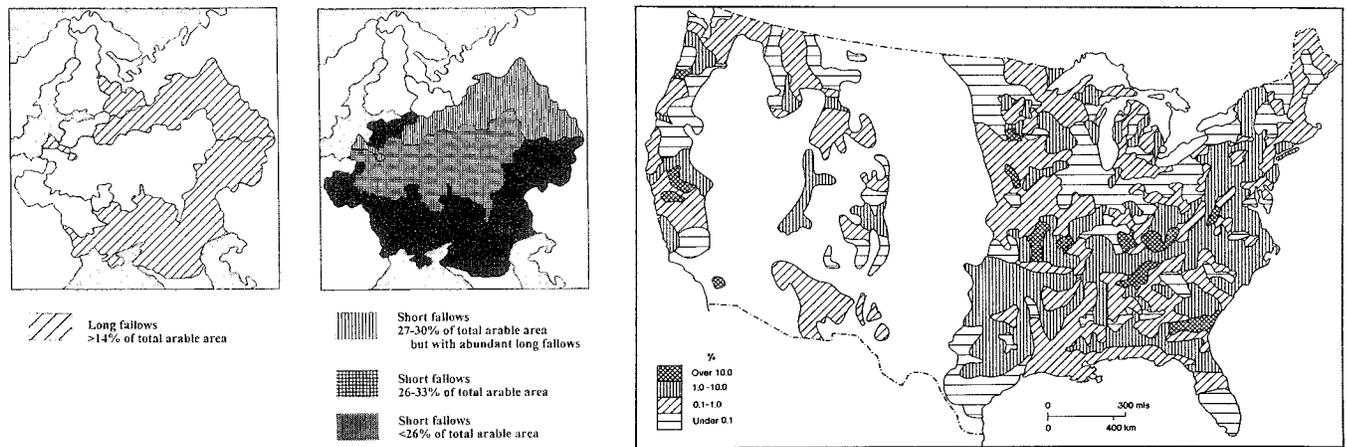


Fig. 3. Fire Follows Fallow.

(Left) The east-driving wedges in the Russian maps represent both bioclimatic influences and settlement patterns. For the most part agriculture, broadly conceived, determined the geography of European fire. Adapted from Judith Pallot and Denis J.B. Shaw, *Landscape and Settlement in Romanov Russia 1613–1917* (Oxford: Clarendon Press, 1990).

(Right) So it did too for an industrializing America, as shown on this map of forest fires drawn by C.S. Sargent for the 1880 census. The patchy fire records in the West reflect grasslands and the absence of on-site recorders. Reproduced with permission from Michael Williams, *Americans and Their Forest* (Cambridge University Press, 1989).

for another. Colonizers could not, in the end, deny the logic of an Earth fluffed with combustibles and soaked in oxygen. There might be more fire or less fire, there might be efforts to suppress certain kinds of undesirable fires kindled by natives, malcontents, and ignorant immigrants, but there was no expectation that fire itself would disappear or that fire practices could vanish like old smoke. Fire would simply be glossed into the text of the new landscape, the rubrics of a flame-illuminated manuscript.

Certainly this was true for America. The redefinition of fire regimes is exactly what C.S. Sargent's map of forest fires for the 1880 census, Franklin Hough's 1882 *Report on Forestry*, and hundreds of settler journals all corroborate. America was a developing country, most of whose peoples lived by agriculture. Conflagrations might rage during the time of transition, but great wildfires required wildlands, and they would cease as settlement became sedentary and as controlled burning found its niche in the cultivated countryside. Meanwhile, there was little doubt that fire was an inextricable presence, and proper fire use the best means of fire control (Figure 3).

Fire Conservancy: Protecting Land, Preventing Fire

Still, Europe's colonies presented some novel circumstances with respect to fire. There was a natural desire to control the worst fires rather than to rely on their *laissez-faire* recession. There was also a general recognition that in new worlds, opportunities for wholesale reform were possible on a scale never before imagined. In its most dramatic expression, colonizing powers began to reserve lands (typically forested) for the public good. These were an imperial invention; they were possible because the lands were (or could partially be made to be) vacant; and they created an imperative for institutions to administer them. Fire joined famine, malaria, and banditry as a

perceived blight on lands mired in fatalism and rural inertia for which railroads, telegraphs, civil service bureaus, and fire protection could promise hope, progress, and humus-laden soils. What the British called "fire conservancy" had analogues everywhere the imperium of the European Enlightenment spread.

Had those landscapes simply disappeared into a reconstituted agricultural regime, we would not be meeting today. Few of the public agencies sponsoring this conference would exist; and even private institutions would likely be addressing questions other than fire. The geography of free-burning fire—by which I mean fire that responds primarily to conditions of terrain, weather, and vegetation—among the industrial nations traces precisely the creation of official wildlands. It is worth noting how extraordinary these institutions are, how exceptional their presence is in world history, and how fragile is their survival. The oldest do not date beyond the 1860's. Most have a tenure of less than a century. New Zealand has already begun their disestablishment.

The wholesale reservation of lands for the public good was an obvious (if not idealistic) solution to human misuse. Remove humans and you remove abusive human practices. (There was little sense that much of what was attractive about colonial landscapes had resulted from long human manipulation.) The particular arguments for such reserves were to ameliorate the climate, to decouple the ecological syllogisms by which deforestation seemingly led to desiccation. On previously uninhabited islands like St. Helena, Tobago, and Mauritius, Europeans had immediately introduced fire, and as the vegetable mold went up in smoke, so, it seemed, the local climate had become droughty, springs had dried up, rare flora and fauna had perished, and edenic-like isles had degraded into cinders. Those microcosmic experiments foreshadowed macrocosmic doom as similar scenarios appeared to be unfolding

before the eyes of European savants wherever colonization, like a steel wedge, had cracked open the continents. The most direct way to intervene was to deny access to pioneering peoples.⁷

What made such reservations politically plausible was that the land was more or less emptied of humans. The landscapes that were largely vacated at the time of settlement—North America, Australasia, and in a different sense, Siberia—became the particular landscapes for public reserves. Disease had mostly done the task; where it failed, relocations, colonial and internecine wars, and overall social disruptions had pruned populations and prevented a demographic recovery. But because of this population collapse, for a period of time, the anomalous had become the norm: people were gone or rapidly going. In the United States the great era of land reservation occurred precisely at this instant, when the indigenes were fading and the colonizing Europeans had not yet arrived in great numbers. A few decades either way and it is unlikely that those reserves could have been made. They were a magnificent historical accident (Figure 4).

One important consequence was that, to exploring Enlightenment philosophes, that landscape seemed preternaturally wild. Relic bands of indigenes appeared no more competent to shape the scene than did those minor streams that occupied the great valleys previously scoured by Pleistocene glaciers. The land seemed fresh from the Creation. Natives dissolved into it like salt in the ocean. In reality, this perception was a freak of historical timing. The reality was that the land had been as fully occupied as peoples' technologies had allowed. Most landscapes were intensively shaped by indigenous practices. Many landscapes in the Americas and Australia were as fully anthropogenic as any found in Europe. Much of the New World had experienced human settlement far longer than had the Old. But during contact, the land had gone feral. Colonizing Europeans had, as one critic expressed it, found a garden and left a wilderness.

Where the indigenous peoples persisted, the reserves were always compromised. Even a handful of graziers could wield enormous power. Here, reserves endured because of political force, backed by legal statute or military cantonnement. Such quasi-inhabited landscapes continued to burn. This was as true of southern crackers in the Carolinas as of Ghond tribesmen in central India. Whatever the legal regulations regarding access, without suitable fire the reserves were biologically inaccessible. The locals burned. Moreover, fires could ecologically void edicts, fences, and patrols. Once the natives recognized the value officials placed on fire control, they had a ready weapon of protest. Woods arson became endemic.

But where the reserves remained essentially uninhabited, there was no obvious problem with anthropogenic fire. Nor was there an imperative to install a new system of controlled burning. Agricultural fire was necessary only if one lived by farming, grazing, hunting, or foraging on the land. The administrators of the great reserves did not: they only protected those landscapes. Accordingly, they were led to an anomaly

as great as the vacant lands themselves. They could see fire exclusion as not only admirable but possible.

Forestry and Fire: The Paradox of Fire Protection

Foresters, not *jägmeisters* or agronomists or civil engineers, inherited the task of administering the management of forest resources. This development had enormous repercussions for the reserves. Colonial foresters saw fire through a peculiar prism. They almost always found themselves fiercely at odds with indigenous practices, all of which exploited fire. It is no accident that the first question asked at the first symposium on the first large-scale experiment in forest reserves—the 1871 forest conference in India—was the necessity and practicality of fire control. “There is no possible doubt,” wrote Lt. Colonel G.F. Pearson, Conservator of Forests for the Central Provinces, that “the prevention of these forest fires is the very essence and root of all measures of forest conservancy.” That sentiment was echoed by foresters everywhere.⁸

Paradoxically, this was not the case in Europe itself, whose woods continued to simmer over chronic fires. Silviculture, after all, was a graft on the great rootstock of European agriculture. Modern forestry was part and parcel of the Agricultural Revolution that had preceded the better known Industrial one. Agroforestry was the norm, not a novelty. The fire practices of agrarian Europe were those also typical of its woods. Even in 1870 as much as 70% of the Schwarzwald was subject to a swidden cycle that involved cereals, root crops, and oak for which fire was fundamental. At the end of the 19th century French forests around Provence regularly practiced *petit feu* in which strips were protectively burned in regular rotation. Controlled burning persisted in the Ardennes forests until World War I, in the woodlands of the Midi until the 1920's, and in the Baltic pineries, rich with heath, until the Second World War. Fire was as prevalent, and as essential, in Europe's forests as in its fields.

But if woods workers exploited controlled fire, forest overseers hated and feared it. The political dialectics that informed agriculture—the divide between theorists and practitioners, field officers and government ministers, periphery and metropole—also shaped forestry. The argument against fire was that it destroyed trees better suited for timber or charcoal than for ash, that it encouraged graziers and swiddeners to encroach on protected woods, and that it eliminated the humus which was the universal index of ecological health. In nature's economy, fire was a prodigal heir who spent his nutrient capital rather than living off his annual interest. Following fire, biotas degraded; soils eroded; weeds proliferated; hillsides slid; torrents rushed; climates degenerated; and societies became unstable. The glory that was Greece, the grandeur that was Rome, the mystery that was the Maya—all succumbed to the internal rot of deforestation by that unholy alliance of cutting, grazing, and burning. To Europe's servants, fire was a good servant but a bad master. To Europe's masters, fire made for rich parents but poor children. For centuries, however, the only prac-

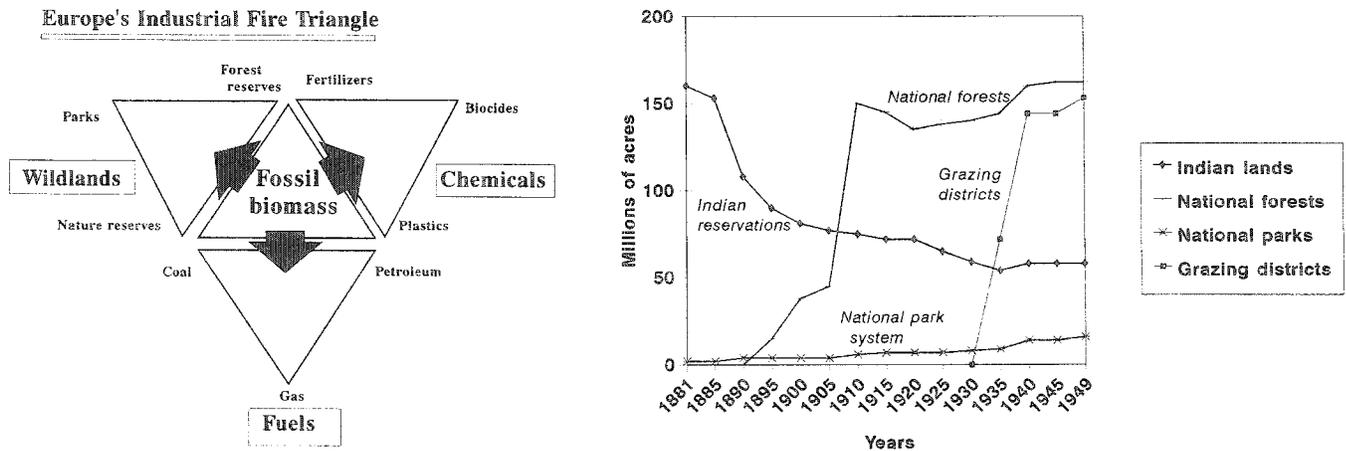


Fig. 4. Industrial Fire Landscapes.

(Left) Europe's industrial fire triangle. Fossil fallow has substituted for living biomass and satisfied the technological requirements of European industry for combustion. But nature reserves have not replaced the biodiversity of the ancient fallows, and the disintegration of traditional agriculture, with its close cultivation practices, has liberated feral fuels that have fed wildfire. Europe has not yet adapted to its evolving fire landscape: it needs better "wildland" fire protection in some places and a restoration of controlled burning in others. Ironically, its former colonies are supplying models.

(Right) America's wildlands, prime habitat for free-burning fire. The establishment of publicly reserved lands interrupted the wave of agricultural fire regimes and created a strange environment that demanded new fire practices. The effort to abolish fire failed, but so has the administrative agnosticism that has merely deferred fire responsibilities to nature. If Europeans need to restore natural processes in the form of fire, Americans need to restore humans, in the form of anthropogenic burning.

tical means of fire control was close cultivation and prescriptive fire use.

This was no less true in 19th-century America. The best hope was to change fire regimes as painlessly as possible, not to eliminate fire altogether. Study Sargent's 1880 fire map and you see a developing nation, profoundly agricultural, remaking itself with steam and industrial capital, but one for which any talk of fire exclusion was utopian nonsense. The character of fire had changed, and would change further. While no one argued that conflagrations like those that swept Gilded-Age Wisconsin and Michigan were desirable, no sane critic argued that fire itself could be expunged. When in 1898 Gifford Pinchot thundered that "the question of forest fires, like the question of slavery, can be postponed, at enormous cost in the end, but sooner or later it must be faced," no one took his abolitionist analogy literally. The problem was to subdue wildfire, and the solution, as always, was to tend the garden and burn the fallow carefully.⁹

Counterfire: Last Fires, Lost Fires

Yet imperial Europe pursued a radically different fire ambition in its colonies than in its own cultural hearth. Ideals long confined to hypothetical islands and practices safely caged in ancient social contexts were transported across the seas and released, propagating like the rabbits on Porto Santo or incongruously imposed like utopian colonies planted in Paraguay. Why? One explanation is political. European powers were prepared to behave differently toward colonial peoples compared to their own. European forces could control indigenes in Cochin, Natal, the Maghreb, and New South Wales in ways that they could not control peasants in Galicia, Dalarna, and Provence. By the mid-

19th century forestry had, in fact, become an inextricable part of European imperialism.

Colonial forestry was a composite, a kind of intellectual and institutional plywood that glued together the separate veneers of Germanic silviculture, French *dirigisme*, and British imperialism. The Germans were supreme as silviculturalists. The French had welded forestry to the purpose (and power) of the state. The British—who at the start of the 19th century had lacked both forests and foresters—had fused the two into a package suitable for export. For Greater India it hired German forest conservators, trained students at the French school at Nancy, and shipped British cadets throughout the Empire. (When that imperium collapsed, so, almost overnight, did British forestry.) It is instructive to recall that Americans like Gifford Pinchot, Henry Graves, and Theodore Woolsey, Jr. passed through this same curriculum; that Pinchot corresponded at length with Sir Dietrich Brandis, doyen of the Indian Imperial Forestry Service (and honored as the "Father of American Forestry"), about how to establish such an organization; that Pinchot later remarked that American foresters had much in common with French colonial foresters in Algeria (!).¹⁰

That unfortunate comment should rattle our consciousness and remind us how much the public lands and public forestry were an imperial invention. Even in Europe, foresters existed primarily as state officers, either to promote wholesale reclamation of wastelands like the Landes, the Hautes-Alpes, or the Jutland heaths, or to intervene between local economies and the larger commercial forces against which traditional practices had too often proved incompetent. After the French Revolution had abolished the old forest regulations, an orgy of cutting and burning had prompted

an environmental Reign of Terror that had left many communal forests in ruins and, more ominously, had stripped alpine slopes to the point that torrents propagated like swarming locusts. State-sponsored reforestation became the preferred remediation, further consolidating the confederation between forestry and the nation-state. That alliance was strengthened overseas. Prominent foresters behaved like proconsuls, moved in the highest circles of imperial administration, and were knighted for their service to the Empire. Forestry was an enlightened despot for the environment.

It is instructive that major imperial powers of Enlightenment Europe were from Europe's temperate core, from lands that did not experience routine fire seasons, that understood fire as an artifact of agriculture. The great powers were also the dominant industrial nations and scientific authorities that dismissed indigenous knowledge as shamanism and folk practices as ecological acupuncture. For colonial landscapes that had known only traditional practices, European forestry was a revolutionary force. For colonial authorities, it was a means of wholesale biotic rationalization and social reform. Through forestry the colonizers would transform irregular wildlands into regularized woodlands, just as institutions of European jurisprudence would transform the jungles of folk legalisms and as railroads would restructure subsistence economies. Fire control was as fundamental to colonial rule as military garrisons, plantations, and acclimatization societies.

This, however, is still an argument to seize the torch, not to extinguish it. It does not explain why foresters believed they should seek to abolish fire. One reason is that they could only envision fire as anthropogenic. Everywhere they looked, human burning had overwhelmed and defined the landscape. Controlling fires and controlling people were one and the same task. Where reserves successfully excluded humans, however, it seemed possible that fires, formerly tolerated as a necessary evil, could likewise be banished. Only later did the potential for lightning fires become problematic. (In a sense, by removing the domesticated fire, foresters would allow the feral fire to replace it.) Ironically, fire exclusion only became plausible because of the exclusion of people. The exemplar of uninhabited isles like tropical Mauritius proved less an ideal than an aberration, a *fata morgana* of agricultural philosophies, and so, too, fire control untrammelled by normal politics—call it imperial Europe's suppression paradigm—shimmered over colonial forests like blue haze.

A second reason follows: foresters did not themselves live in and off those reserves. Foresters protected land. They did not cultivate it. Had they been forced to inhabit those landscapes, they would have been compelled to manipulate them with fire, as people everywhere did, as in fact their professional brethren in central Europe did. They would have had no choice. But they were guards, not gardeners. So it seemed possible—given sufficient political will—to do in colonies what was only quixotic in Europe, to remove fire entirely from the garden. In those colonies

densely populated with indigenes the scheme failed. In those lands effectively depopulated, the experiment could proceed for several decades before its full ecological and economic costs became overwhelming.

Thus forestry behaved differently outside its originating lands. Like so many other European utopias, forestry's was necessarily situated across the Western Sea. The suppression paradigm, released from its originating social ecology, spread like blackberries in New Zealand or cheat grass in the Great Basin. In Europe proper, the quarrel over fire practices was ancient, and the balance of land-use power prevented a massive extinction of burning. What finally snuffed out those flames was the spread of industrialism, the fossil-fallow of coal. The Schwarzwald swidden, for example, expired when steam transport rendered its oak-derived tannic acid no longer competitive against South American imports.

In Europe's colonies the confrontation over fire practices was starker and shorn of traditional checks and balances. Clearly some form of fire protection was mandatory, but what form it should take was not obvious. The collision of European forestry with indigenous landscapes everywhere sparked a public debate about appropriate fire practices and policies. The celebrated light-burning controversy in America had cognates in the early-burning debates that kindled throughout the British Empire. All ended with official condemnation of burning; with the political clout to attempt to enforce that edict even beyond the reserves themselves; and, after 40–60 years, with a recantation.

The reasons for that universal failure are all-too-familiar. The world's biotas obeyed rhythms different from those of temperate Europe; especially where landscapes experienced strong gradients dividing wet and dry seasons, fire persisted in defiance of agronomic and political theory, and ecosystems displayed fundamental adaptations to it. Fire exclusion rendered biotas less stable, less useful, less diverse, and less amenable to fire control. For a while fire protection could be made to work. For a period of time, installing a first-order infrastructure for fire prevention by eliminating indigenous fires, by suppressing long-smoldering fires, and by actual firefighting could dramatically reduce burned acreage. But that grace period would not last. Either the land was converted to some other, less flammable condition or else some strategy for controlled burning had to be introduced.

The mistake everywhere was not that Europeans sought to impose a new fire regime or that they fought wildfires to that end, but that they sought fire's abolition. They failed to recognize that fire's removal was as powerful an ecological act as its introduction. They believed that fire's suppression would liberate oppressed biotas, much as the suppression of famine, typhoid, and Thuggee could free backward societies to progress. Over and again, they interpreted fire in political rather than environmental terms, as the graffiti of ecological vandals, as the torches of barn-burners and rural vigilantes, as the protest of a folk both sullen and prescientific. The tragedy in America, in particular,

was not that wildfires were suppressed but that controlled fires were no longer set.

Even so, early fire control necessarily relied on fire use. Until some alternative pyrotechnology appeared, fire exclusion was a concept as metaphysical as the geography of Gog and Magog or Tomistic arguments for the existence of angels. Until then, paradoxically, the imperial Europe that had sought to abolish free-burning fire had created, with its immense colonial reserves, precisely the ideal circumstances for fire's perpetuation.

TRANSCENDING THE CYCLE: INDUSTRIAL COMBUSTION AND FOSSIL FALLOW

When Carl von Linné died in 1778, the Linnaean landscape of fallow and field, with its ecology of closed cycles and unbroken Great Chain of Being, was beginning a fast disintegration. Two years earlier, Captain James Cook had sailed on his last voyage, confirming an immense age of European exploration and empire. Thomas Jefferson had written the Declaration of Independence, not only inaugurating an era of democratic revolution, but announcing a colonial breakout from the coast into the interior, a vanguard of Neo-Europes. Adam Smith had published *The Wealth of Nations*, proposing a new economic order. James Watt and Matthew Boulton had consolidated their partnership to manufacture steam engines. The closed loops of the Linnaean world fractured; expansion metamorphosed into evolution; nature's cycles became spirals, and society's orbits became the timelines of progress.

Of these momentous events the steam engine was, for fire history, the most profound. Its demand for fuel soon exhausted biomass reserves and compelled the custodians of industrial combustion to exhume lithic biomass from the geologic past. First coal, then petroleum and gas, were a kind of biotic bullion that acted on nature's economy as the plundered wealth of the Aztecs and Incas did on imperial Spain's. No longer was combustion limited by the self-regulating ecology of grown fuels. Fossil fallows could replace living ones; steam transport could restructure the flow of nutrients so that ecosystems aligned with the routes of commerce and the trophic flow of capital; and novel pathways of energy could be built on the controlled combustion of fossil fuels. Industrial pyrotechnologies could replace the fire practices of open burning. It was possible to transcend the closing circles of ecology. It was even possible, it seemed, to apply the new combustion not only in exchange for, but to suppress, the old.

This was critical. However fanatical foresters might be regarding free-burning fire, they could only change, not destroy it, if they wanted to retain forest wildlands. Fire control meant redesigning fire regimes, not abolishing them; fire protection required burned fuelbreaks, preemptive burning around protected sites, and regular *petit feu*; firefighting meant burning out and backfires. In the end, fire remained. In India im-

perial foresters discovered to their dismay that, in order to secure prime groves, native guards were early-burning all the surrounding forests. Fire exclusion was possible, at best, for only a few years. European forestry could no more escape fire than could European agriculture. Forestry was a long-fallow swidden, growing oak, pine, and sal instead of corn, barley, and cotton. Eventually fire would return. Eventually, that is, until industrial combustion arrived.¹¹

With power pumps, fire engines, aircraft, tractors, power saws, and motorized transport it became possible to move firefighters into the reserved lands quickly enough to catch fires while they were small and to meet free-burning fire, at its early stages, with a counterfire force of equal magnitude. It was possible to impose a relative condition of fire exclusion for a longer duration. This cost money, it demanded ever larger investments of technology and firefighters, and it wrenched the biota into successively greater distortions. But it could be done. In the short range, and with state sponsorship for which costs were not matched against the values protected, suppression by rapid detection and initial attack was the most effective means of fire protection. Area burned from wildland fire plummeted.

In fact, fire receded everywhere, telegenic conflagrations notwithstanding. Fires disappeared from the domestic economy, from industrial pyrotechnologies, from agriculture, from forestry, and from many wildlands. Wherever fire was a **tool**, it had to compete with the new pyrotechnologies, and generally it lost. Whatever its ecological merits, open burning existed within an anthropogenic landscape for which free-burning fire and flame's obnoxious side-effects like smoke were no longer desired or even tolerated. The free-fall of free-burning fire promised to stabilize only where fire was essential as an ecological **process** for which no surrogates were possible. Fire retreated like grizzly bears and Karner blue butterflies to special preserves. The geography of fire became one of massive maldistribution—too much wildfire, too little controlled burning; too much combustion, too little fire.

Of course the ideology of fire control mattered. Without the vision of fire exclusion, there would be more anthropogenic burning in the United States today, as well as less ecological havoc, and a better equilibrium between fire use and fire control. But the larger trajectory of fire history argues that industrial pyrotechnologies were destined to substitute wherever possible and that free-burning fire would recede into those habitats deliberately reserved from settlement. The epic of American fire, like all epics, is a tragedy.

Certainly American fire history has its peculiarities. The actual system evolved through historical accidents. Had the public lands been confined to parks instead of broadcast reserves; had the 1910 fires not coincided with the light-burning controversy; had great fires not traumatized Coert duBois, William Greeley, Ferdinand Silcox, Stuart Show, and others of that formative generation of professional foresters; had the forest reserves remained in the Interior Department, shackled by the inertia of other public lands; had ear-

ly fire ecologists thought in cyclic instead of evolutionary metaphors; had another administration, less sympathetic to forestry, presided over the Great Depression; had the Second World War not kindled an arsenal of fire weapons and ended with apocalyptic fire imagery of Hiroshima and Holocaust; had war-surplus hardware been melted into scrap-iron instead of recycled into an armory of firefighting apparatus; had the Cold War pivoted around commercial or linguistic rivalries instead of thermonuclear weapons; had the United States not been endowed with abundant fossil fuels, cheaply sold for a consumer society; had fire restoration begun with anthropogenic fire rather than wilderness fire as its philosophical core; had any of a thousand events, personalities, ideas, tools, and serendipitous decisions gone differently, the fire scene in the United States would not look as it does.

What America has most contributed to this saga is to define the two contemporary poles of the Earth's fire axis. It has demonstrated the power of an industrial society to eradicate all but wildland fire and, at least temporarily, to suppress even those fires. It has illuminated the extreme ecological perturbations that such an attempt can induce. At the same time, American experiences validated the biological and symbolic authority of natural fire in wilderness. America's vestal fire became the lightning fire in a virgin land. What America lost was the dominion of anthropogenic fire.

CONCLUSION: STRANGE FIRE

That, in brief, is the Grand Narrative of how, from its origins in European agriculture, the justification for fire control evolved and how, under colonial conditions, fire suppression became segregated from fire use and how, under the impress of industrialization, suppression led to the chimera of fire exclusion.

Even now Europe can hardly conceive of fire outside a social context. A lightning-caused fire is a freak of nature, a monstrous birth, or where assimilated, a sign from a deity. The perpetual fires of Europe were those that burned on altars and in hearths and they were indissolubly identified with the society that nurtured them. The prescriptions for appropriately tending them were rigorous and invariant, or else the ceremony or sacrifice might fail. But so were the prescriptions for all fire practices. Agriculture could not afford random ignitions or firings outside the social artifice of the cultivated landscape. Yet when it expanded, Europe continually encountered fires that stood outside those dominions.

In the Old Testament is told the story of Aaron's sons, Nadab and Abihu, who sacrificed, with incense and without authorization, before the perpetual fire at the temple. In the words of Leviticus, they offered a "strange fire," and for this sacrilege they were themselves consumed with a "devouring fire" in reply. So, too, Europe encountered strange fires as its voyagers spied the smoke of distant shores and its Corps of Discovery plunged into fire-tempered landscapes. Those alien and profane fires were countered with a devouring fire in response and, following industrial-

ization, often a devouring fire suppression. The most profound of the modern epoch of extinctions may be that of anthropogenic fire.¹²

Linnaeus could never have imagined a world without fire. On his travels he met wildfire in Lapland, and throughout cultivated Sweden, he encountered controlled fires for farming, forestry, grazing, tar, potash, lime, charcoal, every imaginable human endeavor. No less than its woods, the age-structure of Sweden's towns also betrayed their fire history. Some places needed more fire, some less, and others a different regimen. Yet even as Linnaeus relished nature's exotica, he pondered their utility. So he did also with the species of fire he studied: the problem was to make the strange useful.

The question of strange fire remains. To the European, for whom the garden is the model of nature, the strange fire remains the fire outside the cultivated landscape. To the American, obsessed with wilderness as the paragon of nature, that sacred fire can come only from lightning, and anthropogenic burning is a profanity before the altar. In fact, both Garden and Wilderness are negotiated landscapes, roughly arbitrated between human will and natural process whose meanings are socially constructed.

What both share is the tragedy of the excluded fire. Europe is wrong to dismiss fire other than cultivated and to assume that fire can, in alien wildlands, be abolished. But America is wrong to refuse fires set by humans. Neither the wildfire nor the extinguished fire resides at the focus of human life. Humanity remains the keeper of the planetary flame, whether in the Garden or the Wilderness. The Earth's central fire remains the anthropogenic fire. Any other fire practice is truly strange.

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NOTES

This lecture derives from *Vestal Fire. An Environmental History, Told Through Fire, of Europe and Europe's Encounter with the World* (Seattle: University of Washington Press, in press). That work contains a full bibliography. Accordingly, I have restricted my citations here to direct quotations.

1. The episode is well documented in Swedish sources. An excellent summary (with English translations) is available in Gunhild Weimarck, *Ulfshult. Investigations concerning*

the use of soil and forest in Ulfshult, parish of örkened, during the last 250 years, Acta Universitatis Lundensis, Sectio II 1968 No.6 (Lund, 1968), pp. 45–47.

2. For a good introduction to the concept and its connotations, see Harold C. Conklin, "An Ethnological Approach to Shifting Agriculture," *Transactions of the New York Academy of Sciences* 17 (1954), pp. 133–142. For Bartlett's ascerbic evaluation, see H.H. Bartlett, *Fire in Relation to Primitive Agriculture and Grazing: Annotated Bibliography*, Vol. 2 (Ann Arbor, 1957), p. 511.
3. Quoted in Marc Bloch, *French Rural History*, translated by Janet Sondheimer (University of California Press, 1966), p. 213.
4. The full title: *Specimen Academicum de Oeconomia Naturae submittit I.J. Biberg* (Uppsala, 1749). The standard English translation is available in Benjamin Stillingfleet, *Miscellaneous Tracts Relating to Natural History, Husbandry, and Physick*, 2nd ed (London, 1762), pp. 37–129.
 Linnaeus' meditation on divine retribution was intended for his son, not for publication, but the miscellany of essays and notes was later issued in several editions as *Nemesis Divina*.
 The vision of a pure nature operating with a perfect equilibrium of force and counterforce would also find its way into social philosophy, not least of all the American Constitution.
5. Boerhaave quoted in Gaston Bachelard, *The Psychoanalysis of Fire*, translated by Alan C.M. Ross (Boston, 1964), p. 70.
6. See William H. Goetzmann, *New Lands, New Men. The United States and the Second Great Age of Discovery* (New York, 1986), and for a somewhat different interpretation, Stephen Pyne, "Space: The Third Great Age of Discovery," in Martin J. Collins and Sylvia K. Kraemer, eds., *Space: Discovery and Exploration* (Hugh Lauter Levin Associates, Inc., 1993), pp. 14–65.

For Linnaeus' Apostles, see Wilfred Blunt, *The Compleat Naturalist* (Viking, 1971), pp. 183–191.

7. The best treatment of these island "experiments," and the reason for my reference, is Richard H. Grove, *Green Imperialism. Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism 1600–1860* (Cambridge University Press, 1995).
8. Lt. Col. G.F. Pearson, "Report on the Administration of the Forest Department in the Several Provinces Under the Government of India, 1871–1872" (Calcutta, 1872), p. 9.
9. Gifford Pinchot, "Study of Forest Fires and Wood Protection in Southern New Jersey," *Annual Report of Geological Survey of New Jersey* (Trenton, 1898), Appendix, p. 11.
10. See Gifford Pinchot, *Breaking New Ground* (University of Washington Press, 1972), especially pp. 6–9; Herbert Hesper, *Leben und Werk von Dietrich Brandis 1824–1907* (Westdeutscher Verlag, 1975), pp. 327–384; Pinchot observations in Theodore S. Woolsey, Jr., *Studies in French Forestry* (New York, 1920), p. vi.
11. An interesting corroboration of this fact comes from a Russian fire specialist who spent six weeks in California in 1994 and offered as his first impression the observation that Americans relied more on machinery than Russians, who typically resort to counterfiring. "American and Russian methods of fighting large forest fires are profoundly different. Because the Russian Federal Forest Service does not have a sufficient number of airtankers and helicopters for direct attack methods, control of an initial attack fire is frequently achieved using a backfire." Remove that power equipment (and the money behind it), and you would see fire restored, although not in a form prescribed burning advocates would prefer. Quote from Alexander K. Selin, "Forty-two Days in California," *Wildfire* 5(1) (1996), p. 36.
12. For an exegesis of this curious passage, see John Charles Laughlin, "A Study of the Motif of Holy Fire in the Old Testament" (Ph.D. thesis, Southern Baptist Theological Seminary, 1975), pp. 125–133.