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Agents of Empire: Steps Toward an Ecology of Imperialism

Timothy C. Weiskel

The first step to understanding man is to consider him as a biological entity which has existed on this globe, affecting, and in turn affected by his fellow organisms, for many thousands of years.

Alfred W. Crosby, *The Columbian Exchange* (1972)

When contemplating the invasion of continents and islands and seas by plants and animals and their microscopic parasites, one's impression is of dislocation, unexpected consequences, and increase in the complexity of ecosystems already difficult enough to understand let alone control, and the piling up of new human difficulties.

If we look far enough ahead, the eventual state of the biological world will become not more complex but simpler—and poorer.

Charles S. Elton, *The Ecology of Invasions* (1958)

It may not be improper to characterize as ecological imperialism the elaboration of a world organization that is centered in industrial societies and degrades the ecosystems of the agrarian societies it absorbs. Ecological imperialism is in some ways similar to economic imperialism. In both there is a flow of energy and material from the less organized system to the more organized one, and both may also be masked by the same euphemisms, among which "progress" and "development" are prominent.

The anthropocentric trend I have described may have ethical implications, but the issue is ultimately not a matter of morality or even of *Realpolitik*. It is one of biological viability.

Roy Rappaport, "The Flow of Energy in an Agricultural Society" (1971)

Imperialism engenders a particular type of ecological drama involving several characteristic phases or acts.[1] The play has been repeated many times, and as with all classical drama, the plot is now well understood. Indeed some might argue that there is a depressing repetitiveness to the successive enactments of the colonial eco-drama, as if man and nature knew how to write only one scenario and insisted upon staging the same play in theater after theater on an ever-expanding worldwide tour.

In the First Act of the drama colonial expansion fosters biotic interchange as the *dramatis personae* are introduced to one another and the stage is set for the ensuing acts. Old associations of species are disrupted and new communities are created on the basis of novel associations, representing new interactions and altered flows of matter and energy in localized ecosystems.

Following rapidly upon the early period of "biotic admixture" is a second phase involving the explosive behavior in populations of selected species. Which species experience population explosions in this manner is not a random or accidental matter. It has to do in the first place with what niches may have been left unoccupied or underoccupied in the "eco-terrain" of the colonial encounter.[2] Basically, intrusive exogenous species are able to exploit previously underoccupied eco-niches which they fortuitously encounter simply upon arriving in their "new world." Alternatively, selected populations of indigenous species may thrive exceptionally well and discover new-found vitality from an infusion of exogenous material or energy afforded by the colonial encounter itself.[3]

Another variant of this process for some animal species is that in new environs intrusive species can alter their behavior to exploit more successfully a different portion of their "potential eco-niche." Most animal species limit themselves by habit or choice to a "comfortable" or "optimal" portion of the full range of their potential eco-niche space. In new environments populations of the same species often shift their behavior to exploit a new subset of their potential "eco-niche" space. In that process exogenous intrusive species may find that they thrive on the newly discovered portion of their potential eco-niche. If they are intelligent beings, they may attribute their new "success" to such things as foresight, insight, or genius for "improving" their environment, but they do not often fully comprehend the processes in which they participate. While always acting as conscious, intentional, and purposeful agents, human beings rarely have been fully aware of the nature, power, or extent of their own agency in complex ecosystems.

The possibility of explosive expansion clearly is not limited to exogenous species. Similar shifts in realized eco-niches can occur among populations of endogenous species under the impulse of new energy flows, new techniques, or the implementation of novel ideas afforded by the colonial encounter. In this sense a new "eco-terrain" is created for the endogenous species not by altering the environment per se but by altering the energy flows within it or the technology or exploitative strategy applied to it. Thus, Amerindians who may have exploited a highly diverse estuary ecosystem in a pre-Columbian circumstance often chose to pursue more specialized hunting activities when equipped with imported, explosive, killing technology. Because they exploited a newly realized portion of their potential eco-niche, those populations may well have prospered for a short time during the colonial period as never before.

Quite clearly the drama of colonial ecology does not stop here. A Third Act rapidly unfolds. Indeed, outlining this in a sequential fashion and labeling it as a "third" phase may falsify our understanding of it, because it appears simultaneously with the "second phase" of population explosion and can only be separated from it in a logical—not a chronological—sense. The primary rule of ecosystems still operates: *in an ecosystem you can never do just one thing.* Hence, the explosive

expansion of some populations generates an entirely new eco-niche space for other resident populations, differentially intruding upon their prospects for successful feeding or breeding.

In communities where recently juxtaposed varieties of species are jostling to occupy the same eco-niche, contests of competitive exclusion can occur, and when they do, the encounter can appear very much like a zero-sum game wherein one population's gain is another population's loss. It is not surprising, therefore, that population explosions are accompanied by nearly simultaneous population collapses elsewhere in the newly constituted system. Colonial encounters, in that sense, are typically multifaceted. They favor the expansion of some populations and are detrimental to the survival of others. It is perhaps best to refer to this as a combined "second/third" phase involving simultaneous features of "explosion/collapse."

Struggles of competitive exclusion may be dramatic, but they are relatively short-lived. Their resolution inevitably leads to an asymetrical power relation wherein one population or community comes to sustain itself from an asymetrical flow of material and energy from the other. In ecological terms this means that new relations of parasitism (and occasionally predation) establish themselves soon after initial periods of seeming straight-forward competition.

In the aftermath of the explosion/collapse scenes and following the struggles of competitive exclusion, the determination of which species thrive and which fail is not random. Colonial ecosystems are not crap games where chance alone governs. Rather, there is a definite pattern clearly discernable in the apparent chaos of shifting niche allocation. That pattern is similar to the events involved in species succession. In other words, colonial ecosystems—like other ecosystems that have been radically disturbed—demonstrate *sequential* as well as *synchronous* structure. These circumstances favor populations of opportunistic species in the early stages after disruptive events. Over time those "opportunists" give way to other populations or species more capable of exploiting specialized niches in a stable manner within increasingly complex ecosystems.

The disruptive events in the colonial encounter are those created by the explosion/collapse syndrome or the struggles of competitive exclusion in the second/third phase of the colonial encounter. It is as if there were a biological "shootout" or an ecological "shake-down" in those early stages of the colonial encounter, leading after initial phases of confusion to a radically simplified environment characterized by "ecological vacuums" or "neo-niches."[4] In moving into those newly created ecological vacuums opportunistic species enjoy significant momentary dominance in the unfolding drama of colonial ecology. Analytically, that can be discussed as the Fourth Act of the colonial eco-drama.

Examples of the fourth phase abound in the documentary record of colonialism, particularly in the "white settler" variety. European agriculturalists typically moved into what they regarded as "virgin land"

only after a phase of radical disruption characterized by the explosion/collapse syndrome of epidemic disease and massive death among the resident endogenous species and human inhabitants. The whole process is frequently represented in the thought and utterances of literate partisans as if the "white" human populations simply expanded upon "empty" territory, settling "new frontiers." But that is largely ideological bravado, deliberate obfuscation, or simply self-delusion.

Cases from Australia, South Africa, and North America are so numerous and so formative in the historical experience of the cultures in those regions that the settler colonies have commonly been called "frontier" societies. The label is apt in the sense that it is along the ecological frontiers in those regions that the most crucial encounters of those societies have been decided. But the cultural representations of the ecological struggles have been, at best, only approximate and more frequently inaccurate.

In ecological terms it is possible to characterize those agrarian "frontier" societies as populations that have adapted themselves to extend and exploit opportunistic species—usually a relatively narrow range of Poaceae (Gramineae)—in the wake of the radical ecosystemic simplification fostered by the explosion/collapse syndrome in the early stages of the colonial encounter. Despite a well-documented record of the sequence of events in that process, few white settler societies have sought to write their history in ecosystemic terms.[5] The reasons may well have to do with the ideological difficulties those societies would likely experience were they to face up to the moral dilemmas embodied in the next Act of the colonial eco-drama.

The Fifth and final Act in the eco-drama involves the development of mature pest and predator populations that emerge within the colonial ecosystem to establish new kinds of enduring symbiotic relations with the intrusive species or populations, keeping their explosive behavior in check and deriving sustenance from them. In ecosystemic terms, the logic of the Fifth Act is for all remaining characters to move towards the creation of stable patterns of symbiotic community interaction by dampening population oscillations and adjusting to one another's needs within the parameters of local materials cycles and energy pulses. The ecosystems move toward creating communities that resist either the import or export of matter or energy from locally sustainable materials cycles based on the continuous flow of solar energy. Because the story line of the colonial play depends upon the *asymmetrical* flow of materials and energy, when the asymmetry stops, the drama ends. Having played out their eco-drama, the exogenous *dramatis personae* retire from predatory expansive roles to those of stable symbionts while some of the remaining endogenous species once again regain a measure of vitality.

While this has happened in isolated historical cases, it should be emphasized that it is rare, for when it happens, colonialism itself ends. In those circumstances some other play has to be presented in the theaters

of the world, and that would require considerably more imagination than those who write the current scenarios for humankind bring to the task. For the time being, it is clear that there is no serious danger of the play being changed on a wide scale because powerful *dramatis personae* and the supporting actors in the colonial eco-drama (as well as the spectators themselves) are all clamoring for repeat performances of Act Four.

Indeed, because of the rave reviews of Act Four among literate populations, the play seems to be able to extend itself on a world-wide tour on the strength of that Act alone. Little attention is given retrospectively to Acts One, Two, and Three; they are mere prologue. So much excitement is packed into Act Four that neither the audience nor the performers ask what comes next; audiences simply want to see the Act over and over again, in one language after another, on one stage after the next. The demand for Act Four has been so sustained in recent years—perhaps because of its "sex and violence" scenes—that it would seem the "only show in town." Indeed, the actors have perfected their performances in the roles represented in Act Four to such an extent that they would be at a loss to know what to do in any other dramatic roles, let alone any other plays.

Whole schools now exclusively teach young actors to perfect their evolutionary movement on the ecological stage in this peculiar act. Students begin to internalize their assigned parts and conceive of themselves exclusively in terms of the role of rapid and heroic intervention into local ecosystems to rape, reap, and weep. They often call themselves "developers" or "development economists," or some such title, and they seem to gain audience sympathy and demands for repeat performances on the basis of how much they rape, how much they reap, and how often they can make us weep. The more we weep, the more we seem to want the Act repeated. So gripping is the performance that no one on stage or in the audience has seriously questioned whether the play should be staged again. To question such a thing in public is impolite, indeed it is downright subversive, because above all else, "the play must go on," even if only in its strangely repetitive and stunted form.

Given these compelling circumstances and the repeated calls for encores, it is best to reexamine what occurs in Act Four from an ecosytemic point of view in order to assess the chances for repeat performances. To do that it must be recognized that the expansive growth scenario represented in Act Four has long since transcended its origins in the history of "white settler" societies. Just as Shakespeare has been translated into German and countless other languages, so too the essential ecosystemic features of the predatory agrarian expansion can be rendered in circumstances that simulate the white settler eco-niche in economies now located on other "new frontiers." In Act Four the essence of the drama is the repeated creation and exploitation of eco-niches through the simplification of indigenous ecosystems and the active propagation of a narrow range of genetically selected, opportunistic species.

Despite its popularity, there are troublesome signs that the eco-drama currently presented in the Globe Theater cannot be sustained indefinitely on the first Four Acts alone. Economies of straight-foward plunder have fallen into disrepute. But perhaps most disconcerting is the growing realization that human beings have committed themselves to a seemingly unstopable process of converting solar-based agriculture to petroleum-based agriculture in the name of "development," or even more absurd, "greater productivity."[6]

To catch a glimpse of the enormous changes currently going on in the colonial eco-drama, we can jump imaginatively into the future and try to look at ourselves as future archaeologists might as they uncover the soil profile of our civilization.[7] Although most of our familiar surroundings and habitual activities will disappear without a trace in geologic time, there are clearly several realms of human activity—to which we may not give much explicit attention in our everyday lives—that will leave indelible and puzzling patterns for future archaeologists to contemplate. In many areas throughout the tropics—most notably in regions now referred to as the "Third World"—archaeologists will have to account for a thin, almost indistinguishable stratum in the terrestrial soil profile corresponding perhaps to something as brief as 100 to 500 years in time, depending upon its location.[8]

This archaeological stratum will be very revealing. Laboratory analysis will show evidence of substantial shifts in the floral and faunal populations, an efflorescence of new cultigens, a remarkable invasion of exogenous material culture, and a considerable upsurge in rates of soil erosion and sedimentation. Moreover, future archaeologists will likely observe evidence in the stratum of a staggering change in human population dynamics marked by an absolute growth in total numbers and dramatic changes in settlement patterns. The changes reflect an exodus of rural areas and a relocation of populations at transshipment ports or in urban agglomerations along major terrestrial transportation networks that serve as arteries for the distribution of imported grain supplies. The evidence also will probably further demonstrate that these local population dynamics accompanied the rapid and extensive genetic collapse of many previously abundant animal and plant species and, in some cases, led to their virtual extinction. What followed was an even more rapid human population collapse, due either to massive death or accelerated out-migration.

Because this is speculating about the future, the full extent of what our would-be archaeologist will find must remain uncertain. Nevertheless, many of the stratum's characteristics are already determined, because the processes that leave such geologic residues for the future are now firmly underway and seemingly irreversible.

Although this may seem unsettling, it should not be surprising. After all, the evidence about ourselves and our contemporaries that will be revealed in the soil strata of the future is already abundantly present in the historical record and in our own anthropological field notes. The

problem is that as social anthropologists we have not always tried to "read" the historical record or our own field notes as an archaeologist might. If we did, we might discern the fundamental shifts in the human condition to which we have been privileged witnesses.

One of the problems in assessing the evidence is that although we witness these events, we are not always dispassionate observers. From the periphery of empire, the entire colonial eco-drama can appear to involve the "draining" of resources "out" of the system. But this is a myopic perspective, because it must be recognized that from the point of initial contact onwards the "ecological population" has been transnational and intercontinental in nature.[9] Resources have not "left" the system; instead, the system has changed in scope and in the process the resources have only been transferred to another portion of that new system. Resources that previously sustained local populations have been redistributed within physically expanded networks to sustain a new ecological population that is now global in its extent. Nevertheless, the subjective sense of "rip-off" or exploitation persists among local populations on the periphery of empire, as if they were being weakened by growing numbers of intrusive and increasingly voracious parasites. In the face of these feelings some local leaders harbor the thought of rejecting the new system altogether and seek vainly by economic, political, or social mythologies to regain a measure of autonomy within the global ecosystem.

For communities or populations that are the beneficiaries of the system-wide redistribution involved in the new parasitism, the illusion of *self-generated* wealth is a form of parochial self-delusion. This is the social correlate of the self-made man—an equally prevalent mythic theme in beneficiary communities. In the collective consciousness of those societies, it is as if the transition of their economies to self-financed industrial expansion occurred spontaneously, on its own, with no relationship whatsoever to the contemporary fact of global ecosystemic devastation, colonial plunder, and the slave trade. Those phenomena are considered to be simply historically coincident with the *real* history of the West, which is taken to be the history of the progressive flowering of a unique industrial and cultural genius.

Indeed, those cultures are so enamored with what they perceive to be their *very own* success, that they are convinced that other populations need only follow their example to experience similar levels of well-being. In the process they lose sight of the fact that the very success that Europeans initially enjoyed has precluded the possibility of other populations following their example. Development in one part of the global system has been facilitated by the systematic underdevelopment of other parts of that system. The development process cannot, therefore, simply be emulated elsewhere, because the world's ecosystem has been significantly restructured and substantially altered from what it was when European merchant capital began its initial outward thrust. That is the essential achievement of colonialism: Colonialism integrated previously isolated ecosystems, enforcing a new system-wide eco-logic that grew out

of the experience of species admixture, struggles of competitive exclusion, and the evolution of new forms of parasitism. Henceforth, in ecosystemic terms there are no externalities, neither to ecologies nor to economies. "Development" is a zero-sum game with a vast new array of players, living and yet to live on the planet. Calculations must now be system-wide in scope and inter-generational in their temporal concern.

The outward thrust of European cultures since roughly the fourteenth century, spearheaded by the quest of merchants for new materials and markets, has lead to an ecological experience of explosive "growth" in certain parts of the overall ecosystem through microenactments of the colonial eco-drama. Local cases of that impressive growth have dazzled some participants in the process to such an extent that they have come to regard continuous growth as a "natural" feature of a *stable* economy. By this they usually mean that in market-integrated societies relative social stability would be threatened if growth were to slow significantly or to cease altogether. Economists generally fall into that category, and they have developed skills to advise political leaders who, for transparent reasons, wish to stimulate growth.[10]

So complete has been the ethnocentrism of these economic and political elites that they have failed to recognize that in nature's economy positive growth rates regularly engender unstable circumstances characterized by tragic boom-bust syndromes and the imminent threat of annihilation. In large portions of nature's economy growth is understood as a passing phase in the transition toward the maturity of an organism or population. If growth continues for too long, something has gone awry. Enduring positive growth is an index of either prolonged immaturity or of pathological cancer. So long as a growth phase is maintained, a transition to maturity is impossible. Moreover, if it continues unrestrained, death to virtually the whole population may result just as it can in individual organisms afflicted with unrestrained cancerous growth.

Two important models of population dynamics are instructive about the dilemma that is most acute in Act Four of the colonial eco-drama. Ecologists have long talked about the differences in population growth dynamics of "K-selected" species versus "r-selected" ones. In general terms K-selected species tend to be large animals, often mammals, with prolonged gestation and neo-natal development periods that emphasize the importance of teaching and learning for survival. They usually produce a small number of offspring and invest a sizable energy and resources to assure their survival. They are said to be "density dependent." As their numbers increase and approach a theoretical limit or carrying capacity in a given environment, these species typically respond by varying their reproductive rate through spacing pregnancy or they limit population growth by other means.

By contrast, r-selected species tend to reproduce at a constant positive rate, their offspring are usually numerous, and little inter-generational socialization is required for survival. This reproductive strategy gener-

ates repeated boom/bust cycles of growth and collapse as populations overshoot the carrying capacity of a given environment and subsequently die off in massive numbers. Species that depend upon the natural energy pulses in the earth's ecosystem fall into that category. Herbivorous insects and rabbits may represent those kinds of species, because their reproductive behavior conforms to that boom/bust syndrome, one that is largely regulated by a food supply that is tied to the rate of primary photosynthetic production.

In the past ecologists and anthropologists alike have felt confident that humans are best understood as a K-selected species. There is certainly a considerable gestation period involved in human reproduction, and the neo-natal, cultural learning processes necessary for survival are perhaps the most complex known among mammals. Moreover, in at least some instances, there is good ethnographic evidence of density-dependent behavior. Pre-agricultural societies as well as some island-dwelling and sedentary agriculturalists demonstrate conscious efforts to limit reproductive rates as their numbers are thought to approach a perceived carrying capacity.

While a K-selected model may appear most appropriate in understanding the human species on an organismic or small population level, there are disturbing indications that *if broader spacio-temporal scales are employed for the analysis of human populations*, human behavior—at least since the agricultural revolution—may well appear to approximate that of an r-selected species. Over long periods of time and over very large areas, human populations have expanded—perhaps fitfully but nonetheless inexorably. In that process the local carrying capacity with a given technology has repeatedly been exceeded and populations have collapsed, generally through out-migration but also from increases in disease and warfare.

Given the high surplus value that can be derived from child labor in most agrarian contexts, it can be argued that the entire strategy of agriculture itself forms an enormous positive feedback loop in ecological terms. The more children one has, the more food one can produce; the more food one produces, the more children one can have.[11] If local soils became exhausted, out-migration was the frequently chosen behavioral alternative to massive death in the face of that pattern of persistent r-selected reproductive behavior.

If the human population can be thought of as an r-selected species, it may well be true that since the development of agriculture there has been an irreducible ecological component to outward expansion that seems to be at the heart of the imperial impulse. Having chosen agriculture, humans tied their fate to pioneering opportunistic and colonizing species of grasses; in the process they organized themselves into populations of pioneers, opportunists, and colonizers. Such populations depend for their growth, as do their supporting plants, upon the continuous simplification of natural ecosystems and the persistent struggle to keep those ecosystems in the early stages of the successional sequence.[12] It is in

those immature stages of succession that the photosynthetic process produces the highest net biomass, and it is from that biomass that humans have chosen to live since the advent of seed-based agriculture.

This age-old drama has its most impressive staging in Act Four of the colonial play. In this instance, humans as agents of empire feel most entitled to simplify local ecosystemic complexity, bending and channeling the flow of energy toward selected species of nutritional or economic value. In that process heroic and repeated efforts are made to create simplified environments and to struggle against the ecosystemic movement toward system-wide maturity.

But are we simply condemned to live in these permanently immature or pathologically expanding ecosystems? Is this the fate of all grain-based agricultural civilizations, a depressing replay on an ever-expanded scale of the boom-bust cycles of past agricultural societies?

The answer is no. It is true that we are all subject to parochial and subjective perceptions of the eco-drama because we have emerged as conscious beings within its participant cultures. Once having recognized its scenario, however, we are not hopelessly condemned to play out the role assigned to us—even if that was the only part we learned in school. It may take a measure of courage to step out of our assigned role, but it can be done. It is possible through personal and collective reflection upon objective information to arrive at less culture-bound assessments of our role in the ecological theater and even to begin to ask what might happen if the whole play could go on to Act Five. In short, we are all creatures of culture, but we are not necessarily its helpless victims.

Because humans are not primary producers in the earth's ecosystem, there are practical upper limits to the total number of human/years that can be supported by this open energy system on its closed material base. Since the emergence of colonial ecosystems, there are new parameters to the zero-sum game, but it has now become a zero-sum game in a global ecosystem with ourselves and future generations as players. Just where the total number of human/years will be experienced on the earth's surface and what level of material cycling and energy consumption will be expended by whom—these are the significant questions concerning our future.

One thing is certain: expanding numbers of people cannot simultaneously be supported with high rates of material cycling and energy consumption for countless years to come. The promise of continuous growth is simply a delusion—no matter how sincere or desperate the belief of those who preach its possibilities. The "pie" cannot expand infinitely in terms of humanly habitable, permanently sustainable ecosystems. That is so because there is an eco-logic to all ecological systems, and over time there is an ecological reckoning of all subordinate economies within them. The economy of nature will ultimately impose itself upon the economies of humans. Our principle capacity as intelligent beings lies in our ability to perceive that situation and to adjust to its

reality before the eco-logic of the global system is forced upon us with the brutal clarity of catastrophe.

That insight is not new. Nearly a century ago Friedrich Engels issued the same warning:

> Let us not, however, flatter ourselves overmuch on account of our human victories over nature. For each such victory nature takes its revenge on us. Each victory, it is true, in the first place brings about the results we expected, but in the second and third places it has quite different, unforeseen effects which only too often cancel the first. . . . Thus, at every step we are reminded that we by no means rule over nature like a conqueror over a foreign people, like someone standing outside nature—but that we, with flesh, blood and brain, belong to nature, and exist in its midst, and that all our mastery of it consists in the fact that we have the advantage over all other creatures of being able to learn its laws and apply them correctly.[13]

The fact that this insight has been around for more than 100 years is not encouraging, because in the intervening period we have not developed social and economic institutions on the basis of its wisdom. On the contrary, the most arrogant forms of colonialism and the most explicit programs for "dominating" nature have been put in place since 1876 when the essay was published. In cultural terms, clear individual perception may well precede a capacity to act collectively by decades or even centuries.

Whatever the past reasons for our collective myopia, there is no longer any reason to mis-perceive the circumstances that lie before us. When the legacies of colonial ecosystems are kept clearly in mind, it is apparent that not only is the "pie" not expanding, but it may already be substantially shrinking in terms of the capacity of large portions of the earth to support tolerable human life on a permanent basis. Faulty or misinformed decisions concerning our ecosystem in the coming years could substantially reduce the total human/years remaining as part of the earth's ecosystem.

Development "experts" who proceed in the name of the "Green Revolution" or Third World development schemes to intrude upon complex and fragile agricultural systems with plans for monocropping a narrow range of genetically selected, petro-intensive cultivars would do well to consider carefully the ecosystemic implications of their activity. In order to promote "development," complex agro-ecologies are being overhauled and simplified with new and reputedly more "efficient" cultigens. By driving other species into virtual extinction through displacement, however, these modern-day agents of empire are playing dangerously with the future of humankind. As the Stanford biologist, Paul Ehrlich, has observed:

> One of the most serious side-effects of the Green Revolution is the accelerating loss of reserves of genetic variability in crop plants, variability that is badly needed for continuing development of new strains. A multitude of traditional

crop varieties . . . are rapidly being replaced by a relatively few high-yielding varieties throughout large areas. . . .

Aside from nuclear war, there is probably no more serious environmental threat than the continued decay of the genetic variability of crops. Once the process has passed a certain point, humanity will have permanently lost the coevolutionary race with crop pests and diseases and will be no longer able to adapt crops to climatic change [emphasis in original].[14]

It is a troublesome fact that proportionately greater numbers of humans have come to depend upon a progressively narrower range of primary producers, the latter cultivated with increasingly energy-intensive technologies in ways that have accelerated the depletion of nonrenewable resources. If continued unchecked, this trend could be a recipe for an ecological catastrophe among human populations. In the coming decades humans will need to control these trends if massive disaster is to be avoided. In light of the probable changes in global climate that seem to be imminent, deliberate efforts will need to be made soon to refashion human-made economies to work within the economy of nature. In a more general sense, a concerted study of the ecology of imperialism cannot help but lead to the sober realization that the growth strategies characteristic of market-integrated economies over the last 500 years need to be urgently reassessed—not just for the sake of those economies, but for the sake of human survival in large portions of the globe.

Acting as purposive but incompletely informed agents in wider systems, humans both intentionally create and often unwittingly spawn little empires within the broader plant and animal kingdoms. We alter energy flow, change the distribution of species, engineer extinctions, and select favorable living companions. Yet in those complex processes our impact as ecological agents is not always what we would suppose or propose. The justifications for manipulating other life forms for our own purposes have often been questioned on moral grounds, but there seems to be an added dimension in the case of ecological imperialism. As Roy Rappaport reminds us, "the issue is ultimately not a matter of morality or even of *Realpolitik*. It is one of biological viability."[15]

In short, we may not be able to survive the biological empires we *think* we can generate for our own purposes. That is because our ability to intrude upon and alter specific organisms in our surroundings is not matched by an equal sophistication concerning the intricate connectedness of organisms in their total environment. At this point there is no such thing as a predictive ecology, and for that reason any particular step we take to alter organisms for our use is bound to have unforeseen consequences, some of which we will likely not be able to control.

Nowhere is that more clear than in the study of the ecology of imperialism. Ever since the creation of Phoenician and Greek colonies in the Mediterranean, agents of empire have intruded upon local ecosystems and done their best to manipulate individual species to their own benefit. In their wake they have left—often unwittingly—a legacy of deforestation, plant genetic impoverishment, soil degradation and ero-

sion. In more recent times, the ecology of imperialism has proceeded with mechanized technology and mercantile motivation. The devastation of local ecosystems has been correspondingly greater, and at the same time it has been accomplished in shorter and shorter periods of time.

This cannot proceed indefinitely. In the global circumstance that now confronts us, our long-term survival depends upon learning how to function *within* plant and animal kingdoms, not in setting ourselves up against them or in cultivating the sadly characteristic imperial illusion of control. There is considerable room for optimism; in taking the first steps toward understanding the ecology of imperialism, we may yet come to understand our role as agents of empire, perhaps even in time to circumvent the more catastrophic scenarios of decline and fall.

Notes

[1]The metaphor of a drama is borrowed from G. Evelyn Hutchinson's *The Ecological Theater and the Evolutionary Play* (New Haven, 1965). But the sense in which the term is used here differs from Hutchinson's.

[2]In a strict sense, a niche cannot be said to be "unoccupied." That is so because a niche can only be said to exist because an organism occupies it. In a less formal sense, however, a niche can be defined more abstractly as a feeding strategy. In this sense there can be such a thing as an "unoccupied" niche, because there are many unrealized feeding strategies in any ecosystem. The latter concept of niche is employed here.

[3]Those population explosions take place in real historic time and should be easy to observe and document, but in practice that proves difficult. The problem, in part is that the reproductive cycles and population dynamics of different species or communities vary enormously so that it is difficult to choose a time frame within which to identify *significant* activity. Changes initiated almost immediately by the introduction of new "weed" populations, for example, may not affect animal food supplies for several growing seasons, and thus they may not intrude upon human food supplies for many generations, if at all. Perhaps because of a general species arrogance, we have usually taken the disruption of human food supplies as the index of *significant* ecological change, but as current research indicates, those disruptions are usually epiphenomena to far more pervasive ecosystemic transformations whose crucial stages can no longer be directly observed. To examine what has happened we must resort to hypotheses or logical models of reconstructed processes, because the communities concerned have been radically altered and the historical events cannot be repeated.

[4]The concept of "neo-niche" used here is borrowed figuratively from Alfred Crosby's depiction of "neo-Europes" created around the world by European settlers. See Alfred Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (New York, 1986), 6-7, 10-11.

[5]Important exceptions to this reluctance can be found in recent studies by Alfred Crosby and William Cronon. While Crosby's work, *Ecological Imperialism*, affords an inspiring overview and broad vistas of new possibilities in this realm, Cronon's excellent study, *Changes in the Land: Indians, Colonists, and the Ecology of New England* (New York, 1983), provides a new standard for undertaking deliberate historical documentation of particular colonial ecosystems.

[6]Agents of empire are now actively at work converting the few bio-sustainable agricultural ecosystems that remain to permanent dependence upon non-renewable, fossilized energy subsidies. While that kind of "Rambo interventionism" leads to impressive temporary spurts of production and does much to glorify the agents of empire in their capacity as visiting "experts," petro-intensive agro-ecosystems are notably *less efficient* in terms of energy than the solar agricultures they often replace.

[7]Soils that reveal human agency in the past can be understood as "historical documents" of a special sort that can be "read" for evidence of cumulative behavior. Archaeologists have developed considerable skills in deciphering the messages of what geologists call "anthrosols." See Robert C. Eidt, "Theoretical and Practical Considerations in the Analysis of Anthrosols," in G. Rapp, Jr. and John A. Gifford, *Archaeological Geology* (New Haven, 1985), 155-90.

[8]Clearly the depth of this profile will vary considerably from place to place. Although most soils are likely to be very thin, in some riverine, estuarine, and marine environments close to colonial terrestrial systems, this stratum will represent a sedimentary layer that is likely to be quite thick for the reasons summarized below.

[9]An "ecological population" is defined as those conspecifics who share the same food supply. In that manner it is possible to say that Bostonians and Ethiopian relief victims are part of the same ecological population because they both receive their food from the grain supplies of the American Midwest.

[10]The reason that politicians in elective democracies favor growth involves the promise that it will provide "bigger and better" things in the future. Populations can be persuaded to endure extraordinary privations and gross inequities if the myth of future opportunity can be sustained. If the economy is not expanding, however, the evident inequities of any social system become intolerable, not because conditions themselves are objectively worse, but because the myth of being able to overcome contemporary difficulties is destroyed. Elective politics is based on the calculus of hope. As a result, politicians in market-integrated democratic regimes tend to favor strategies that promote growth, because it is on the promise of better things to come that they are re-elected.

[11]It certainly seems to be the case historically that the early stages of the commodification of agriculture correspond to periods of positive population growth in localized agro-ecosystems. It is less important to demonstrate the cause-effect relationship in this context than it is to point out the demonstrable coincidence of these phenomena as a positive feedback mechanism.

[12]Reputed improvements in agricultural technology have not been as impressive in the expansion of human food supplies as the overall expansion of land under cultivation. Humans have not notably altered the photosynthetic efficiency of plants they have selected for agricultural purposes, even though they may have selected plants with the most usable portions of their total biomass.

[13]Friedrich Engels, "The Part Played by Labor in the Transition from Ape to Man," in E. Leacock, ed., *The Origin of the Family Private Property and the State* by Friedrich Engels (1876; reprint, New York, 1978), 260-61.

[14]Paul Ehrlich, Anne Ehrlich, and John Holdren, *Ecoscience: Population, Resources, Environment* (San Francisco, 1977) 343-44.

[15]Roy Rappaport, "The Flow of Energy in an Agricultural Society," *Scientific American* 225 (September 1971), 122.