THE ECOLOGICAL PATHOLOGY OF MAN

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INTRODUCTION

When taken as a serious and dispassionate object of study from the standpoint of the science of pathology, the human species is easily recognized as a global pathogen. Incontrovertible evidence on all sides tells us this, and yet we have steadfastly avoided an honest look in the mirror. We so often choose—willfully and with strong convictions sustained by homocentric prejudice—to hide the facts from ourselves, and to proceed with untroubled ignorance to overlook the worldwide human and natural devastation for which our species is responsible.

Throughout its development, the science of pathology has embodied this homocentric bias that reserves the application of the clinical-diagnostic label 'pathogen' to non-human agents, such as disease-producing bacteria, viruses, or more recently discovered prions. But the concept of pathogenicity does not of itself dictate an exclusionary application to other-than-human forms of life.

In *The Pathology of Man: A Study of Human Evil* (Charles C. Thomas, 2005), I have argued *the case against man*, identifying and seeking to explain in psychological terms pathologies for which the human species is responsible. There are unfortunately many. They include a varied and psychologically rewarding palette of emotional and cognitive gratifications provided by vicarious or direct participation in violence, by ideological rigidity and absolutism, obedience to perceived authority, prejudice and persecution, sheer self-defeating stupidity and low levels of moral development, and their many sequelae in genocides, terrorism, wars, school, domestic, social, and political bullying, publicly approved imprisonment, torture, and executions, an unappeasable appetite for human reproduction, the unquestioned placement of human interests above those of all other life forms on the planet, the enforced subservience of non-human life to human wishes and convenience, and the resulting devastation of global biodiversity. The list of human pathologies does not end here.

Central to human pathology, in the intended sense here of "human evil," is human resistance to an awareness of it. "Denial" would be an understatement, for the forces that stand in the way of mankind's reflective consciousness of the malignancy of the species are incredibly strong, tenacious, and self-preserving.

As a result of human recalcitrance to acknowledge our own pathology, in the history of behavioral science, and in particular in the history of psychology and psychiatry, almost no effort has been made to gain an understanding of human evil. Primarily among psychiatrists there have been a few notable exceptions who have had the courage to examine the pathological constitution of the ordinary person who so often is a willing participant in inflicting suffering, death, and destruction. But despite the work of these few researchers, psychology and psychiatry have doggedly reserved the term 'pathology' exclusively for application to individuals and groups judged to be abnormal. This is short-sightedness in the extreme.

Hannah Arendt (1964) recognized that many so-called "psychopathological" perpetrators of atrocity are, at base, no more and no less than psychologically normal people. But the reverse, and the much stronger clinical and moral indictment, has received virtually no attention: that "psychologically normal" people—that is to say, the great majority of all human beings in all parts of the world—possess an emotional and cognitive constitution that encourages them to behave and to think in pathogenic ways, i.e., in ways that are manifestly hurtful and destructive to other people, often indeed to themselves, as well as to other forms of life and to the resources upon which all life depends.

This is the broad context for the chapter that follows, reprinted from *The Pathology of Man*. In excerpting a single chapter from a long work of 21 chapters, it is unavoidable that readers are forced to read such a selection "out of context." To supplement the above introductory comments, it is important for readers to bear in mind that in the book two fundamental claims are laid out in some detail, claims which cannot be amplified or defended here. The claims are these: First, among those issues which are of overriding importance to humanity's and the world's future, there is little that is as imperative as a clear comprehension of the psychological realities that underlie human evil. Second, accomplishing this task no more reflects misanthropy than does—to give a parallel example— seeking for a clinical understanding of physiological malignancy. Given the unbounded pride we tend to take in our species and the ease with which many people take offense at its criticism, a few words from the book's Introduction are in order: "There is much that human beings have created that is wonderful, inspiring, and good.... [T]here is nothing here that denies or depreciates these things. But just as concrete, detailed descriptions of examples of good health are largely irrelevant in a medical compendium of diseases, so are instances of human goodness largely irrelevant to our present focus." The science of pathology has its appropriate subject-matter.

A last preliminary remark: Pathology is primarily concerned with the identification, description, and classification of disease-producing agents. Pathology is not medicine, and so its main purpose is diagnosis rather than treatment. Human pathology has been so little understood that we are not yet in a position to devise and offer effective treatments for most of the ills for which we are the pathogen. *The Pathology of Man* is a diagnostic and descriptive study; it offers a starting point. The presupposition of the work is that we must first understand before we can treat and perhaps cure.

The chapter that follows focuses specifically on human pathology as it is expressed within the world's complex ecological system. Demographic figures that were mentioned are, as expected, already out-of-date. The number of human infants added *daily* to the population is now close to 300,000. —Or, in less than two weeks from today, the equivalent of a city of three million will be populated, and yet another in the next ten days, and so on, as we advance into an increasingly packed and mass-suffocating future. Where the world population stood at six billion only a few years ago, it now numbers six billion, plus some 500 million more that have since been added. For most of the individuals, families, and social groups that make up this gigantic accretion to the human biomass, crowding and the struggle to live decent, worthwhile lives will present increasingly difficult challenges. And for the relatively few human beings who find meaning in life only when life can be aesthetically uplifting, most of the natural world, as well as the once uncrowded human world, is already ruined by the effects of relentless human reproduction and proliferation.

If we are to gain control over our own worst enemies—ourselves, and specifically our psychologically normal constitution that fosters pathology while disowning it—we have no other constructive alternative than to begin by gaining an effective understanding of the psychological causes of human pathology, of human evil in all its manifestations. Human ecological pathology is only one of these.

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THE ECOLOGICAL PATHOLOGY OF MAN [1]

> One of the penalties of an ecological education is that one lives alone in a world of wounds.... An ecologist must either harden his shell and make believe that the consequences of science are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise. – Leopold (1966:197)

In earlier chapters, we examined the phenomenon of human evil from a variety of perspectives, focusing on the psychology of human aggression and destructiveness as these are directed by people against others of their own kind. Unfortunately there is another side of the story: the destructiveness of mankind toward other species and toward the conditions required to support life. Like human aggression, obedience, genocide, propensity to war, and other subjects we have considered, human ecology can be considered from a psychological point of view. Man's environmental rapacity and destructiveness and his extermination of other forms of life are exercised sometimes with self-awareness, at times without it, but most commonly they are deeply entrenched in psychological resistance to acknowledge the malignant, pathogenic side of self-interested human activity. (See Bartlett 2002.)

Although this is a time of increased environmental awareness, there has been no serious study in the literature of ecology of the role of the human species in its capacity as a global pathogen. One might imagine that such a study would examine the environmental depredation and reproductive behavior of the human species, and draw attention to evidence of a non-metaphorical, malignant parasitism that has become planet-wide. This chapter seeks to make a beginning. To do this, it is important that we understand what parasitism is and describe certain key concepts of parasitology which apply to the role of the human species in relation to other forms of life.

THE NATURE OF PARASITISM

Parasitologists have found it difficult to define parasitism due to the complexity of possible associations between

[1] Excerpted from Steven James Bartlett, *The Pathology of Man: A Study of Human Evil* (Springfield, Illinois, U.S.A.: Charles C. Thomas, 2005), Chapter 17, pp. 253-71. Reprinted with the permission of Charles C. Thomas, Publisher, Ltd. Copies of the book may be ordered directly from: http://www.ccthomas.com/details.cfm?P_ISBN=0398075573

different species. In its most general sense, parasitism is a relationship in which one organism, the parasite, derives benefit from its association with another organism, its host, while the host is harmed to a degree that varies from an insignificant degree of detriment to the loss of the host's life due to the damage done to it by the parasite. (See, e.g., Matthews 1998:12-13; Poulin 1998:66; and Marquardt, Demaree, & Grieve 2000:5.) Traditionally and in the public mind, parasites have been associated with invasive, usually microscopic, organisms that infect the host, live in its body, multiply, and cause temporary harm, permanent disablement, or death. The popular conception of a parasite leads people to think of tapeworms, hookworms, or perhaps a protozoan like *Plasmodium*, which causes malaria.

These are examples of so-called *endoparasites*, which may either inhabit spaces between cells in the host's body, or live within its cells, as in the case of bacteria and viruses. Intracellular parasites are frequently transmitted by a carrier, called a vector. In the propagation of malaria, for example, the anopheline mosquito is the vector for *Plasmodium*. In addition to endoparasites, there are *ectoparasites* that make their living from the surface of a host's body. They include leeches, lice, fleas, ticks, and some larger parasites, for example, vampire bats and the pencil-thin fish, the candiru, a species of catfish that inhabits rivers in Latin America. The candiru is a feared parasite that attacks human beings who happen to urinate while bathing in rivers. The candiru follows the stream of urine and swims forcibly up into an individual's urethra. Once its teeth have secured it within a person's vagina or penis, the fish can be removed only with great difficulty, if at all.

Beyond ecto and endoparasites, there are other forms of parasitism, in which one species exploits another: There is so-called *brood parasitism* in which, for example, the cuckoo usurps the nest of the reed warbler or the cowbird, throwing out its eggs or its already hatched nestlings, and laying its own eggs to replace them. *Social parasitism* is practiced, e.g., by some species of ants that enslave other ant species. And then, parasites themselves may become parasitized, a relationship called *hyperparasitism*: For example, a flea living on a cat may have a protozoan parasite living in the flea's intestinal tract.

Parasitism is distinguished from *parasitoidism*, also a relationship between two species, but one in which the parasite kills the host. Parasitoidism is, one might say, a terminal form of parasitism. It occurs, for example, in a wide range of insect species in which the female injects her eggs into the body of the host, or deposits them on its surface. The eggs hatch and the larvae proceed to devour the host. Parasitoidism is common in certain species of butterflies, moths, flies, ants, wasps, and bees.

It will be important in this chapter to understand several other terms from the vocabulary of parasitology, which identify some of the main ways in which organisms interact: *Symbiosis* is a broad category that includes associations that may be established between organisms of different species, called symbionts. Symbiosis is subdivided into mutualism, commensalism, and parasitism. Any association between two species that live together is considered to be symbiotic, whether they benefit, harm, or have no effect on one another. In *mutualism*, the associated organisms both benefit from the interrelationship. For example, certain bacteria and cattle live in a relationship of mutualism: The bacteria living in a cow's digestive tract both aid the cow's digestion and live in an environment that benefits them. *Commensalism* is a relationship between two species in which one profits from its association with the other, while the second is neither harmed nor benefited. Clown fish, for example, obtain shelter and security among the stringing tentacles of sea anemones, an apparently one-way benefit that does not cost the anemone. And in *parasitism*, as we have seen, one species is benefited and the other, to some degree, harmed.

There are other possible relationships between organisms. Among them, *amensalism* is a relation between two organisms of different species in which one remains unaffected while the other is noticeably harmed. The affected individual may be deprived of food or space in which to live, a result of *competition* between the two species, or it may be injured or killed, the result of *antibiosis*. (See the earlier discussion of antibiosis in Chapter 1.) Antibiotic amensalism and parasitoidism, then, are closely related. Strict antibiosis occurs when an organism secretes toxins that inhibit the growth or kill another organism; parasitoidism is generally less specific, killing its host in one of many possible ways as a result of its activity. And so, in the deserts of the western United States, chaparral prevents plant overcrowding in an environment of scarce water by means of antibiosis, inhibiting the growth of potential competitors in a defensive zone around each chaparral clump. Parasitoidism occurs when a wasp injects its eggs into a paralyzed caterpillar, and then hatch larvae that will consume from the inside and eventually kill their host.

In order for a parasite to maintain its natural life cycle, new hosts must be infected. The *infectivity* of a parasite is determined by its ability to find new hosts, and by the degree of susceptibility or resistance of the host to infection. Parasitism is often measured in terms of the *pathogenicity* of a parasite population. The pathogenicity of a parasite is a function of three things: its infectivity, the size of the parasite population in the host, and the amount of damage for which the parasite population is responsible.[2] The specialized vocabulary which makes it possible to differentiate distinct

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[2] Parasitologist C. R. Kennedy has expressed these relationships in the following more precise form: *Infectivity* (I) = the parasite's host-finding ability + the susceptibility/resistance of the host. Then, *pathogenicity* = I × the number of parasites in the host × damage to the host/parasite. Cf. Kennedy (1976:4-5).

forms of parasitism will be useful to us later in this chapter as we consider mankind within the context of the millions of non-human species with which we share the world.

PARASITOLOGY AS A BRANCH OF ECOLOGY

Valentin Aleksandrovich Dogiel (1882-1955) was a pioneer in approaching parasitology from an ecological viewpoint. Traditionally, parasitologists have studied the relationship of an individual organism to its local environmental niche, often a particular host's body. This focus upon a well-defined microcosm has been advantageous because it is sufficiently finite to facilitate controlled observations. In recent years, some ecologists have sought to extend Dogiel's work. They have attempted to broaden the scientific understanding of organism-environment relationships by including increasingly more encompassing layers of the earth's total system of ecology.

As a result of the more comprehensive perspective of ecological parasitology, the definition of 'parasitism' is being widened so that parasitism is understood to be a particular kind of ecological relationship between a parasite and the environmental conditions upon which it depends for its survival and reproduction, a relationship that causes some degree of harm to the parasite's environment. In the case where the necessary environmental conditions are provided by another organism's body, the relation is that of parasite to host organism. Calling such a relationship ecologically parasitic forces attention to be directed to two things: the dependency relation that exists between the individual organism and its requisite environmental conditions, and the cost to the environment that the parasite's continued existence, reproduction, and proliferation exact.

It is important to observe that the concepts of parasitism and predation are closely allied. As one parasitologist observed, "It has proved difficult to define parasitism and to draw the line between parasitism and predation." (Halvörsen 1976:100) What we identify as a host is, for the parasite, its prey, while, for the host, the parasite is predator. When predation becomes excessive, we see the extinction of one species by another. During the 1930s, in research now seldom remembered today, microbiologist G. F. Gause (1934a; 1934b; 1934c) sought to throw light on the conditions that lead to the extermination of one species by another, or to their mutual destruction. In one series of experiments, Gause was interested in testing the theoretical assumption advanced by mathematicians that under stable conditions in a controlled microcosm populations of predators and victims would exhibit natural periodic fluctuations. Gause, however, found that these expectations are not always borne out. For example, when two populations of organisms, one of which is a predator and the other a prey, coexist in an environment that provides an abundance of food for the prey, the predators multiply greatly, devour all of the prey, and then die out themselves. This dynamic in which predator and prey populations both become extinct was not anticipated. (See Dogiel 1965:657-8) Gause's experimental work laid the foundation for the *lethal level concept*, proposed by H. D. Crofton (1971). Crofton saw that most parasite species are able to kill their hosts when they are present in large enough numbers. As one would expect, lethal levels vary from one parasite-host system to another. Crofton's concept will be useful in our later discussion of the dynamics of human population growth.

As advances in parasitology have brought the field into closer contact with ecology, they have made evident to us that parasitology and the study of infectious disease frequently share the same subject-matter. Many parasitologists now accept an enlarged definition of 'parasite' that includes the standard classes of pathogens, including viruses, as well as so-called "selfish DNA." Large portions of human DNA, as well as the DNA of other species, are apparently inessential for the purposes of normal biological processes. These segments of DNA have been termed "selfish DNA" or "genetic parasites." (Cf. Dawkins 1976; Combes 1995). It has been hypothesized that such DNA segments use companion genes in a "parasitic way" in order to replicate themselves. (Zimmer 2000:127)

The three fields, then, of parasitology, pathology, and the ecology of predator-prey systems share a common interest in investigating interactions between species whose activities and life cycles affect one another. The three fields are losing their traditional boundaries and beginning to fuse. At one end of the spectrum of use, the phrase 'microbial predators' (Zimmer 2000:128) is applied in the context of infectious disease theory; and, at the other, the phrase 'behavioral parasitism' is used to refer to larger forms of life that are not physiologically dependent upon their hosts, but nonetheless exploit them—e.g., birds that steal the food from members of another species (see, e.g., Barnard 1990). Within this widened frame of reference, the terms 'parasite', 'predator', and 'pathogen' have meanings that are essentially interrelated, differing principally according to the user's disciplinary identity, rather than according to subject-matter.

As parasitology comes to involve explicitly ecological considerations, the relation of parasite to host is translated into the relation of parasite-pathogen-predator to host-environment. The transformations in terminology and in conceptual outlook suggest that reality is understood in more integrative and yet more specific ways. For instance, it is now recognized that the environment of a parasite may possess a systems-related capacity to respond to the parasite in ways that actually *block* the parasite's survival. This proposal was first advanced nearly a century ago when ecologists coined the phrase 'environmental resistance' to refer to the responsive potential of a parasite's environment to block its growth and proliferation. (See Chapman 1928.) Environmental resistance is a concept whose meaning, within an ecological context, parallels to a certain extent that of antibiosis. (See Chapter 1.)

During the past two decades, environmental parasitology has enabled us to see more clearly how pervasive parasitic organisms are. Where the millions of species of animals and insects that live on plants used to be regarded as herbivores, it is increasingly common for them today to be classified as parasitic organisms. (See, e.g., Zimmer 2000:45) In recent years, parasitologists have discovered that the proportion of parasitic organisms in relation to free-living species is surprisingly large. One contemporary parasitologist observed: "As far as numbers of organisms is concerned the number of parasites greatly exceeds that of free-living animals." (Matthews 1998:16) Another author noted: "...parasites may outnumber free-living species four to one. In other words, the study of life is, for the most part, parasitology." (Zimmer 2000:xxi) To be concrete: while there are only some 4,000 species of mammals, there are between 8 and 100 *million* species of insects, making up more than half of all species of organisms. Of these, among the multitude of parasitic insects there are 200,000 species of parasitic wasps alone, while there are hundreds of thousands of species of insects that parasitize plants. There are more than 5,000 species just of parasitic tapeworms. When we also take into account parasitic species of bacteria, protozoa, fungi, plants, and larger animals, it becomes evident that by far the greatest majority of all forms of life engages in parasitism. If we include in the count parasitic viruses and parasitic DNA, parasitism pervades even the constituent genetic materials of life itself.

A study of the ecology of parasites has, in short, had a broadening effect upon our general biological understanding of life. A good example of this can be found in a newcomer to the life sciences, evolutionary parasitology, which has in recent decades emerged as a field of study. The discipline investigates parasitic relationships among organisms in order to improve our understanding of evolutionary patterns of descent. Evolutionary parasitology has brought a new awareness: "only now are...[we] realizing that parasites have been a dominant force, perhaps the dominant force, in the evolution of life." (Zimmer 2000:xxii) In addition to expanding the scope of parasitology to include evolutionary studies, environmental parasitology has deepened our awareness of the nature of the relationship between organisms and their required ecosystems. An organism's environment can promote its health, its illness, or its death. It has therefore become meaningful to speak of ecosystems that are healthy or diseased, depending upon whether or not they support the health of species that depend upon them. When an individual species pollutes the environment on a global scale, as the human species does, it acts as a pathogen that undermines the health of a vast range of ecosystems, bringing disease and death to hundreds of thousands of species.

Despite the increased scientific recognition of the ubiquity of parasitism, the human species to date has itself been studied by parasitology exclusively in terms of man's capacity to serve as *host* to endoparasites such as tapeworms and microbial pathogens, and to ectoparasites such as lice and ticks. The focus of parasitology has been homocentric in considering man only as a species preyed upon by other forms of life, by parasites that have traditionally been thought, in evolutionary terms, to be more primitive. As a result, the human species has not been studied specifically as an evolutionarily advanced parasitic species in relation to other organisms, or as a parasite species in relation to the global environment. But the concept of parasitism does not include in its meaning any *exemption* excluding its application to the human species. In what follows, we will begin to apply an understanding of parasitism to man.

THE WORLD AS A GENERAL SYSTEMS HOST

As noted earlier, parasitologists have traditionally focused their attention on organism-environment relationships in a strictly localized manner, studying a given organism's ecological niche as a microcosm in comparative isolation from the complex network of relationships among other species that are not perceived to have explicit associations with it. The host of an individual parasite is usually, from this point of view, a specific, individual organism.

During the past several decades, largely as a result of the research and publications of James Lovelock, it has become popular among perhaps more whimsically inclined scientists and philosophers to regard the earth as a unitary "organism" in which the millions of individual microbial and larger plant and animal species live in their respective ecological niches as though as cells within a body of planetary dimensions. For many scientists, this theory of the earth as a super-organism—called "Gaia" after the Greek Earth Goddess, a name proposed to Lovelock by novelist William Golding—serves as an interesting and meaningful metaphor, but a metaphor only.[3]

Gaia theory is appealing, especially to those who are committed to preserving the natural environment. Gaia theorists have drawn attention to ways in which organisms and the natural cycles in which they function contribute collectively to global homeostasis. This is without doubt scientifically fundamental and important work—work whose

[3] Lovelock's theory was anticipated in general terms by the many poets and philosophers who have described the world in dynamic, organic terms. In language most closely resembling Lovelock's, humanist Dane Rudhyar (1971:21), for example, wrote: "... international scientific studies have shown irrefutably that the Earth as a whole is an organized system of most closely interrelated and indeed interdependent activities. It is, in the broadest sense of the term, an 'organism'." Lovelock's Gaia-related books include Lovelock (1979, 1988, 1991, 2000).

value does not depend in any essential way on whether the global system does or does not comprise a genuine giant organism, a view about which many researchers have expressed reservations.[4] In addition to expanding our detailed knowledge of an interlinked biosphere, the Gaia conception of the planet as a dynamic system made up of interconnected and interdependent species has helped somewhat to diminish homocentrism. From this perspective, the human species is one among many, part of a complex, global system in which the existence of each affects others.

The interrelatedness of the general system that comprises the world is a fact we cannot escape. Within that general system, we see that the human species has evolved and has developed socially and politically as an unusually destructive and ubiquitous parasitic species. There are now few places on earth that remain unaffected by man's presence. *For the parasitic human species, the world has become its host.* And like the most damaging forms of parasitism, the human form is causing huge amounts of devastation, both to other species and to the biological and physical conditions required for their coexistence with man and for mankind's own survival.

HOMO PARASITICUS

> After five million years of serving as a host to parasites, man has himself become one.

The claim that the human species is a true biological parasite has, as far as I have been able to determine, been proposed only metaphorically or in passing.[5] And yet, as I will try to show, human parasitism is pervasive and can be recognized unmistakably using established criteria of parasitism.

The human species is a parasite species in a number of evident ways. In addition to satisfying the general definition of parasitism given earlier, a parasite species characteristically exhibits three properties. These are properties of special interest to parasitologists, and also properties that accurately describe human ecology. They are: *parasite opportunism*, *exponential growth*, and *parasite adaptability*. Together, these species traits more fully define parasitism.

Although parasite species do not always reproduce at rates that exceed those of non-parasitic species, the majority of parasite species are opportunistic. That is to say, if given the opportunity, their reproductive behavior is exploitative: If conditions necessary for their survival and reproduction are met, their populations will grow quickly and they will proliferate rapidly throughout environments that suit them. Parasite opportunism enables a parasite species to gain an ecological foothold, and once established, provided its survival needs are met, the species will reproduce exponentially. Parasite opportunism and the exponential growth that it fosters are functions of the third trait, a parasite species' adaptability.

The ability of a parasite species to adapt to changing environmental conditions is essential to its survival, as it is for non-parasite species. Many parasite species, however, seem to specialize in adaptability: Some are able rapidly to alter their own genetic makeup so as to evade detection by a host organism's immune system, a property that has made treatment of the AIDS virus, for example, so difficult. A moving target is much harder to hit. Other parasite species are able to exercise manipulative control over their ecosystems, and so transform their hosts' environments in ways that make living conditions more congenial. Manuals of parasitology are replete with fascinating examples of both strategies of adaptation.

The applicability to the human species of the three properties of parasite opportunism, exponential growth, and parasite adaptability is direct. Among larger animal species, mankind is without doubt the most successful opportunist. Environmental conditions and the natural availability of food and water do not need to exceed more than a bare minimum for people to gain a foothold, construct shelters, begin to modify their environment to make it conform to their needs, and start a chain of escalating reproduction. The ability of human beings to carve out niches even in the most inhospitable environments is truly astonishing, whether they are settlements in an arid desert, at high elevations, in the arctic, or in the hottest tropics. As one contemporary biologist put it, "if one feature sets humans apart from other animals, it is the breadth of the ecological niche that we presently occupy." (Flannery 1994:142)

An objective characterization of human adaptive skills applies, with few changes in wording, to the abilities of many non-human parasite species to accomplish precisely the same ends: Microbial parasites construct shelters for themselves, encapsulating themselves in the form of cysts, or growing thickened cell walls, or covering their surfaces with chemically

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[4] One of the strongest objections to the scientific legitimacy of a Gaia "organism" was expressed by biologist W. Ford Doolittle: "The biosphere, Lovelock's Gaia, is not a replicating individual, and has no coherent heredity. If her parts contribute to global homeostasis, this cannot be for the same reasons that organs of an animal promote physiological homeostasis.... If individual species do collaborate as one whole, it can only be because some sort of interaction rule like Tit-for-Tat has been selected during their coevolution." (From a short contribution by Doolittle in Barlow (1991:235).)

[5] In terms of Gaia theory, in Barlow (1991:x), for example, we find in the Editor's Preface the following remark: "If Lovelock is on track with his Gaia hypothesis, there exists an organism far more complex and grander than we. Humans may simply be cells (benign or cancerous?) of a single planetary-scale organism." And in a recent semi-popular account of parasitism, Zimmer (2000:245) commented: "It is we who are the parasites, and Earth the host. The metaphor may not be perfect, but it chimes well."

resistant defenses. Many engage in biochemically modifying their food, as numerous species of protozoans have done for eons. Human ingenuity is matched on many levels of parasite life. When man cultivates land, when he domesticates and slaughters animals, even when he develops genetically modified foods, what he is engaging in are precisely processes that define parasitic life forms. When human beings cut down forests and put the land to human use, there is no difference between the nature of this activity and that of any parasite that forces its immediate environment to meet its biological needs. Except in terms of scale. Man is the first known parasite species to manipulate the environment of an entire planet for its own purposes. The global environment has become the host organism for the human parasite.

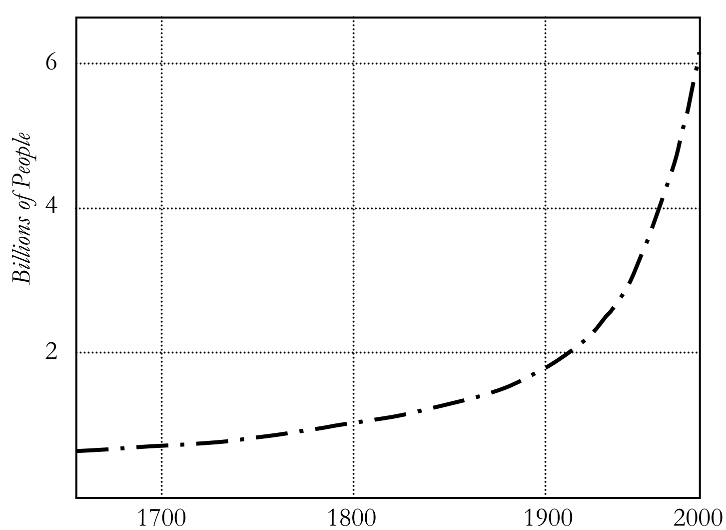
Highly successful as an organism that transforms its environment to satisfy its own needs and interests, *Homo parasiticus* exhibits parasite opportunism and adaptability in their ecologically most penetrating, threatening, and destructive forms. The species opportunism and adaptability of mankind have led to the characteristically exponential growth curve of a flourishing parasite species, at least for a time.

THE POPULATION BIOLOGY OF HUMAN PARASITISM

> There has been more [human] population growth since 1950 than during the preceding 4 million years. – Lester Brown quoted by Associated Press (1999:2A)

What is exponential growth? In commonsense terms, as illustrated in the now well-known studies dealing with the exploding human population, *The Limits to Growth* (Meadows *et al.* 1972) and *Beyond the Limits* (Meadows *et al.* 1992), a population experiences exponential growth "when its increase is proportional to what is already there." (Meadows *et al.* 1972:29) The authors' example, taken from a French riddle, is worth recalling: Consider a pond on which water lilies double in population each day, and which will choke out all other life by the end of thirty days. For many days, the rate of reproduction of the lily population seems insignificant, "so you decide not to worry about it until it covers half the pond. On which day will that be? On the twenty-ninth day. You have just one day to act to save your pond." (Meadows *et al.* 1992:18) The population growth rate of the human species has decidedly been exponential—in fact, during the past few centuries, no other species in the world has had a population growth rate tantamount to man's.

Not all parasite species reproduce exponentially until they harm and perhaps destroy themselves and their environments. On the contrary, many parasite species that have attained evolutionary success seem to follow a biological principle of moderation. They appear to know enough not to exterminate their hosts. They are, in other words, capable of self-regulation. As one author put it, "they are expert at causing only the harm that's necessary, because evolution has taught them that pointless harm will ultimately harm themselves." (Zimmer 2000:245) In many of these parasite species, overcrowding itself functions as a feedback control upon their rate of reproduction. (Kennedy 1976:110) The human species, however, appears to have no built-in governor to rein in its instinctual reproduction, as the following graph of world population makes clear.



World Population
Meadows *et al.* (1992:4)

As we shall see, the exponential growth of the human species is the runaway growth of a pathogen in the process of killing its host.

If the human species suffers and will continue to suffer at its own hand it is due to lack of foresight, to what seems to be a constitutional human inability to make the future real in the species' consciousness. Reality, unfortunately, gives no special dispensation for the imagination deficit of a species. The accelerating rate at which human babies are now being produced may be difficult to imagine, as the human species brings more than 250,000 infants into the world *each day*, or some 150 births per minute. (Of the daily influx of a quarter of a million babies daily, we would need to ship 230,000 of them off the world *each day* in order to achieve a stable population, according to Hardin (1999:135).) The doubling time of the human species has now shrunk to 35 years. Mankind's enormous rate of reproduction mirrors the exponential, opportunistic growth of a parasite population during the early stages of infection of its host. In the case of man, the host is the planet itself and the diversity of species that have evolved on it.

Biologist Garrett Hardin has raised the question whether God gives a prize for the maximum number of human beings. "If we opt for life with nature we opt for fewer human beings and boldly assert that God gives no prize for the maximization of human protoplasm.... Can any trustee for posterity consent to a step-by-step sacrifice of the variety of nature, merely to make possible the maximum number of human lives?" (Hardin 1982:195) The answer, of course, is "yes," for progressive sacrifice of mankind's host is in keeping with the species' activity as a parasite. If the hypothesis formulated here is correct—that the human species is a true global parasite—*significant* reductions in human population growth will not come about as a consequence of humanity's voluntary efforts. This is not a matter of attitude, but of empiricism. Our species' population replacement rate is approximately 2.1. At this rate, a mother and father are replaced, while 0.1 percent allows for mortality of infants and young adults who have not yet procreated. In 1996, the average woman, however, bore 2.6 children. This amounts to a rate of reproduction nearly 24 percent *greater* than the replacement rate. Intelligent, reflective discussions of the optimal population carrying capacity of the world are highly unlikely, in the long run, to make a real difference in terms of humanity's rapidly accelerating growth rate.[6] Parasite psychology has deep roots.

There has been considerable debate concerning the earth's optimal human carrying capacity. Some judge, in terms of quality of life and the preservation of natural beauty, that the world's optimal carrying capacity has already been considerably exceeded. Paul Ehrlich, for example, has argued that the maximum sustainable world population is in the neighborhood of two billion—less than a third of today's population. (Ehrlich 1990) Biologist E. O. Wilson stands with him on this minimalist side of the population discussion. According to Wilson's calculations, "to raise the whole world to the U.S. level with existing technology would require two more planet Earths." (Wilson 1998:282)

It should not take graphs and calculations to prove that any organism's exponential reproductive rate cannot continue for long. Human ecology is no different from that of any organism: land and resources are finite. But the psychology of homocentrism is excessively strong, so much so that it is likely to require catastrophe to reduce human population significantly. To date, even warfare has not cut into population growth very much: From the beginning of World War I to the end of World War II, "only" some 250 million people were killed. (Piel 1994:124) This number of babies will be born in just the next two and a half years. Certainly global cataclysms can be envisioned that would have a more drastic effect in reducing the burgeoning human population, but it is tragic that so many individual people must suffer to curtail a species-driven heedless compulsion to reproduce. The grandson of Charles Darwin, C. G. Darwin, underscored this phenomenon when he called the human species *Homo philoprogenitus* (lover of many offspring). (Lovelock 1979:140)

My point in reviewing some of these perspectives on human population growth is simple: We are accustomed to thinking of the characteristic exponential growth rates of many parasites as applicable only to non-human organisms, and then usually to microorganic pathogens during the early stages of an infection—that is, when their population growth rates closely resemble man's during the twentieth century. We are not accustomed to taking a larger view of the world, situating the human species within that view, and then recognizing that the many psychological, social, and ideological forces that encourage human reproduction are no more than the particular expressions by the human species of the universal drive of any parasite species to reproduce itself. Membership in the human species makes such reflections more difficult: certainly they are frowned upon, dismissed, or denied—as one should *expect* as part of the behavior of a parasite species. For, after all, if mankind is globally parasitic, it is to be expected that his drives, attitudes,

[6] Although hope always sells best, and those who dispense less optimism are dismissed as so many profits of doom, there is substantial empirically-based evidence to support the claim that the human species is on a deadly course. Much of the psychological evidence is presented in this book. Physical evidence and the results of thousands of computer simulations based on it have been presented in studies like Meadows *et al.* (1972) and its successors, Mesarovic & Pester (1974) and Meadows *et al.* (1992). In the last of these studies, the authors comment: "In fact, in the thousands of model runs we have tried over the years, overshoot and collapse has been by far the most frequent outcome." (136)

beliefs, and dogmas will express and reinforce his single-minded parasitic relationship toward other species and toward the world's resources.

THE EXTERMINATOR SPECIES' BIODIVERSITY HOLOCAUST

> If it moves, shoot it. If it grows, chop it down. – Rallying cry of Australia's settlers

> Some humans have dreams...to make the deserts bloom and to make the depths of the sea and even Antarctica yield their bounty. As each year goes by, we come closer to developing the technologies that will allow us to realise these dreams. Each year we also feel an increasing need to utilise marginal lands in order to feed our growing populations. With our dreams fulfilled we will, I fear, see a wave of extinctions so vast as to dwarf anything that has gone before. For we will have become the exterminator species that broke all the rules. The one that could take not only all the resources of rich lands, but of poor ones as well. – Flannery (1994:101)

Paleontologists have found evidence in the fossil record of five major extinctions that have wiped out huge numbers of species. Each of these catastrophes to life has resulted in a loss of many thousands of species. Periods of mass extinction have sometimes lasted for thousands of years. After each mass extinction, it has then taken millions of years for new species to evolve. They have taken the place of the forms of life that were wiped out, but they did not replace them. The species that evolved were new, but those rendered extinct were lost forever.

The five documented mass extinctions were: (1) the most ancient, the *Ordovician* (approximately 440 million years ago; 25 percent of forms of life lost); (2) the *Devonian* (370 million years ago; nearly 20 percent of living organisms lost); (3) the *Permian* (250 million years ago; 54 percent of living species extinguished); (4) the *Triassic* (210 million years ago; 23 percent of living organisms rendered extinct); and, most recently, (5) the *Cretaceous* (65 million years ago; 17 percent of living organisms lost, including the dinosaurs). (See Morrell 1999a:42-56.)

Mass extinctions clearly are not new to the earth's history. What is new is a mass extinction caused by a single species. Such a mass extinction is in progress now. Unlike the mass extinctions of millions of years ago, the mass extinction that is underway is not being caused by catastrophic natural events, such as the impact of a meteor, a period of devastating volcanic activity, or a radical change in climate. It has been called the *Quaternary*, the sixth mass extinction, and it is being caused by the human species.

In the course of its history, mankind has found many complimentary attributes to underscore the uniqueness of the species and its separateness from other animals. Of the many self-ascriptions that philosophers, theologians, and scientists have tried to find with which to praise, elevate, or distinguish mankind, none has carried the force of the appellation that the species has earned during the past few centuries. During this period, the species has distinguished itself in a way that stands very much apart from its traditional characterizations as a featherless biped, a user of tools, the sole possessor of reason or of an immortal soul, as the player of games, or the user of language. The most recent designation that mankind has earned has placed the species in a direct adversarial opposition with the rest of the world: The new distinguishing mark of what Flannery (1994) has called "the exterminator species" makes the phenomenon of human parasitism explicit, by emphasizing the destructive relation of the species to both the physical and the biological world:

The exterminations that the human species is causing are global. All forms of life are being affected: microorganisms, plants, insects, fish, birds, and mammals. For example, biologist Stuart Pimm calculates that within the next century, fully 50 percent of the world's flora may be rendered extinct. Two thousand tropical and subtropical plant species are disappearing *each year*. One in eight species of plants is now at risk of extinction. Already, 11 percent of all species of the world's birds—1,100 species out of a total of 10,000—face extinction. Fifteen percent of bird species are expected to disappear from the Amazon basin within the decade, while 15 percent of the earth's forests will be leveled within the same period. (For a compilation of researchers' estimates of species extinctions per decade, see Groombridge 1992:203; also Morrell 1999a:46.)

What Pimm calls a "worldwide epidemic of extinctions" (Morrell 1999a:46) is occurring because of the collective behavior of our exponentially proliferating species. Natural land is "developed": houses, apartment complexes, industrial plants, and dams are built; the earth is paved over; forests are leveled; human toxic waste pollutes rivers, streams, the oceans, and the atmosphere; the world's ozone shield is increasingly destroyed; land is turned into desert. Already, the human species has degraded 40 percent of the total vegetated land surface on the planet, while it has co-opted or destroyed 40 percent of the food supply relied upon by all species of animals and microorganisms. (Ehrlich 1997:13) — All of these things are occurring as the human population explodes on an almost unimaginable scale, as human beings take up residence and displace other forms of life in virtually every possible habitat.

Mankind has become a world-devouring species, or, to use an appropriate term that has now become rare, it has become *pantophagous*, consuming all that it is capable of, ravaging the resources of its host with true parasite rapacity. The human species has developed a capacity and a will to devour an exhaustively wide array of resources. When one resource is depleted, human beings find ways to satisfy their needs by means of an alternative resource, which they then exploit.

Comparatively feeble, though heroic, gestures are being made to save a tiny fraction of the world's biodiversity. The Millennium Seed Bank at Kew Gardens, for example, hopes to be able to collect samples of 10 percent of the world's plants by 2010. Perhaps at some time in the future, a few that have been pulled into the lifeboat of refrigerated storage may, conditions permitting, be restored. The project is a band-aide, one might say, bravely applied to stanch a severed artery. An equally ineffectual wand to protect non-human species has been waved by legislation. In the United States, since the Endangered Species Act was passed in 1973, some 1,200 species have been listed as endangered or threatened. Of these, fewer than 2 percent have actually been protected over a period of three decades. (Data reported in *Discover*, January, 2000:66) It is not much of a success record. In reality, the gesture toward other forms of life is extremely weak. It is a matter of too little, too late. (For a picture of the relative insignificance of efforts to save species from human destruction, see Groombridge 1992:206-25, 233.)

As a matter of course, species come into existence, and they die out. We live at a time when it is beginning to soak into our consciousness that all things have their lifespans: on a larger scale, suns die and planets perish; on a smaller scale, forests become deserts, drastic changes occur in the global climate, species become extinct. More than 99 percent of all species that have ever lived have become extinct. However, by current estimates, the present rate of species extinctions is some *ten thousand times* the average evident from the fossil record. This year, while 92 million individual human infants are brought into the world, 30,000 non-human *species* will be brought to extinction as a result of human activity: more than 80 species are eliminated from the face of the earth *each day*. (McClintock 2000:65; Powell 2000:54) The death of an individual is a tragedy, but in the public consciousness the death of a species is only a statistic apprehended dimly if at all.

A standard of comparison is helpful if we are to grasp what is happening. During past extinctions, how many species have become extinct each year? Based on the fossilized remains of past extinctions, paleontologists estimate that as many as one species of mammal should normally be expected to become extinct perhaps every 400 years and one bird species every 200 years. These are thought to be maximum estimates: normal extinction rates in the past have probably occurred significantly less often. (Groombridge 1992:197) In comparison, and to use only a single country as an example, the United States threatens the extinction in the foreseeable future of the greatest number of reptiles (25 species), amphibians (22 species), and fish (164 species). For these groups of organisms, the U.S. is the top offending country in the world today. In exterminating birds, the U.S. ranks ninth (43 species). (Groombridge 1992:242)

The mass extinction we are witnessing may turn out to be the largest in the history of the planet. (Myers 1979:5) Already, based on the current rate of extinctions, which is accelerating (Ehrlich 1997:8; Flannery 1994:143; Groombridge 1992:204), ecologists estimate that some 50 percent of all living species will be destroyed. (See, e.g., Novacek 2001; McClintock 2000:65) We are witnessing a *biodiversity holocaust*[7] caused by a single species, our own.

The worldwide destruction of other forms of life by the human species appears to some biologists to be more a side-effect of its activity than an intended consequence. Ecologist R. V. O'Neill has described mankind's destruction of the world's biological diversity as "the metabolism of the dominant animal."[8] When a pathogen causes disease and death in an infected population, it makes little sense to call this intended. Mankind's species behavior as a pantophagous exterminator of life may be no different in this respect.

Some environmental parasitologists have used the expression 'anthropogenic impacts' to refer to environmental damage caused by man. One of the most destructive of these impacts concerns human toxic waste, and specifically human sewage, an inevitable biological by-product of human life. Sewage produced by the rapidly increasingly human population is routinely dumped into streams, rivers, and oceans. The waste is euphemistically called "outflows." Some of the sewage is treated, but most is not. The oceans of the world, in particular, have for centuries been regarded as vast dump sites that can accommodate unlimited human refuse. The scale of this pollution is huge and has still not been reliably measured. Just a single moderately sized modern city will, as a matter of course, dump billions of gallons of untreated waste. During a recent year, Portland, Oregon, for example, permitted three billion gallons of untreated sewage to "outflow" into local freshwater streams. During periods of heavy rain, the quantity of untreated sewage dumping increases, as the capacity of sewer and storm water drains is exceeded. Towns and cities without sewage treatment plants—which still include most communities in the world—are responsible for a major portion of human sewage pollution. Damage is done to non-human forms of life, and also very directly to people, who frequently depend on freshwater streams and rivers as a source of food or drinking water.

As of the year 2000, 58 *dead zones* were identified: These are areas of the sea bordering coastlines and which are now bereft of life. Dead zones come about when nitrogen-rich sewage, other human waste, fertilizer, herbicides, pesticides,

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[7] A phrase coined by Stanford environmental biologist Stephen H. Schneider, from an interview published in *Discover*, January, 2001:60.

[8] O'Neill made this observation at a symposium, "Ecological Economics: Building a New Paradigm for Sustainability," at the 1994 annual meeting of the Ecological Society of America, August 7-11. For his concluding remarks at that symposium, see O'Neill (1996).

industrial waste, and garbage are dumped into the oceans of the world. This waste can then feed a runaway growth cycle of algae, choking the water and depleting dissolved oxygen, a process called eutrophication. Sedentary forms of marine life, such as lobsters, clams, and mussels, are killed. Already, for example, one-third of the Baltic Sea, an area of 38,000 square miles, is lifeless. Half of all estuaries in the United States are now oxygen-depleted. The number of dead zones in the world caused by "outflows" of human waste is expected to double within the next ten years.[9]

Parasites often damage their hosts as a result of by-products that they excrete. *Homo parasiticus* is no different in this regard. The waste that the species excretes—in the form of natural biological waste and industrial-chemical waste—is fouling the ecosystems of an accelerating number of microbial and large plant and animal species. As the human biomass increases and spreads, the waste products produced by the species increase proportionately. The world's rapidly multiplying dead zones are one direct consequence.

Mankind's present exponential rate of population growth cannot of course be continued indefinitely. A projection of the human population's waste products follows along similar lines. Even if the present rate of human reproduction can be reduced to a replacement value of 2.2 (so that real population growth is limited to only 0.1 percent), "the human biomass would eventually equal the weight of the world." (Wilson 1998:281) Human sewage, a topic as unpleasant as it is often neglected, would, however, long since have made man's habitat uninhabitable, and unlivable as well for a multitude of other species.

The oceans of the world, which make up most of the habitat volume within which the earth's organisms live, are rapidly being polluted, not only by human sewage and other human waste and run-off, but by the combined effects of oil spills, thermal pollution from the cooling systems of coastal power plants, and by heavy metal poisoning (e.g., lead, mercury, and arsenic). When these are added to the effects we have already mentioned due to the dumping of sewage, garbage, industrial waste, fertilizer, pesticides, and herbicides, the oceans, long thought to be impervious to human waste disposal, will reach a threshold beyond which it will be difficult—and, for innumerable forms of life, impossible—to return.

As the population growth of the human species persists, lethal levels for other species are reached. It is here that parasitologist H. D. Crofton's lethal level concept acquires its human application. The global population of *Homo parasiticus* has increased in density and distribution on a scale which, were we speaking of a non-human pathogen, we should unflinchingly call an infestation.[10] An ecological saturation point is reached at which the human species, in a monopoly of its own devising, engulfs many of the resources required to sustain life—displacing, poisoning, and actively killing other species in the process. It should be clear that the species, as a result, has become highly *infective* and *pathogenic* in the strict senses of these terms defined earlier in this chapter: For, as we have seen, the human species has developed the ability to spread into and dominate diverse ecosystems with relative ease, causing severe environmental harm and species destruction. This is *infectivity*, *on a global scale*. The already immense and yet still exponentially growing human population is directly related to the amount of damage for which the human species is responsible. Together, these factors determine the *pathogenicity* of the human species, which is also now global in scale.

In biology, the "niche exclusion principle" refers to the fact that, in relation to a given niche of resources, there is often one species that survives at the expense of others that depend on the same resources. The niche exclusion principle is the ecological equivalent of the principle of economic scarcity, which states that commitment to one alternative path of action rules out others that would have been possible. Ecology is the economic theory of life.[11] Biological resources are always finite, so that when an organism's population grows to be sufficiently large, competing forms of life are excluded.

Earlier, I referred in passing to the research of G. F. Gause, who studied the phenomenon in which a parasitic or predatory species over-indulges itself to the point that both it and its prey die out. More than half a century later, University of Arizona biologist Paul Martin (1984) proposed what he called the "Blitzkrieg hypothesis." Both Gause and Martin have offered what are in essence specialized formulations of the niche exclusion principle, describing the destructive displacement of one species by another. Martin has argued that man exterminates other species wherever he goes in a veritable "Blitzkrieg." Martin found that significant numbers of species extinctions have occurred following soon after man's first arrival at any given location, that is, within a period of a few hundred years.

A similar result has been reached more recently by Ross MacPhee, curator of mammals at the American Museum of Natural History in New York City. MacPhee (1997) has studied species extinctions that occurred on the islands of the Caribbean since the arrival of Europeans 500 years ago. He noticed the same pattern: whenever human beings came on

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[9] Based on calculations by marine biologist Robert Diaz of the Virginia Institute of Marine Science.

[10] We recall that Frederick L. Schuman expressed a view similar to this more than seventy years ago (Schuman 1933). His view was described earlier in Chapter 4.

[11] One of the few ecologists to draw attention to some of the potential connections between economic theory and ecology has been Paul Ehrlich. He devotes a chapter to this topic, "Ecology, Economics, and Equity," in Ehrlich (1997: 113-51). Another ecologist urging the establishment of bridges between the two disciplines has been R. V. O'Neill (1996).

the scene, the extinction rate soared. He found that this "dreadful syncopation"—the arrival of human beings followed by numerous extinctions—has occurred not only during the past five centuries, but appears also to have taken place 11,000 years ago at the time of the extinction of the Siberian mammoths. And the same pattern of extinctions has followed in the wake of prehistoric man in many areas of the world, with the possible exception of Eurasia and Africa, where the human species evolved in parallel with other species.

When the Blitzkrieg hypothesis is applied to the worldwide human presence today, the extinction of huge numbers of non-human species is to be expected. In areas once rich in natural resources, the life cycle and activities of the human species reduce a world of biodiversity to a human *monoculture*—to an environment, that is, primarily fit only for man. (See Tilman 1982.) Once such a monoculture is reached, as it has been for increasingly large numbers of species in human cities, densely populated regions, and industrialized areas, general niche exclusion follows in the swath of Blitzkrieg devastation, and lethal levels for a great many organisms are reached. Then Gause's warnings to an over-eating, predatory-parasitic population remind us that our extensive biological and physical destruction can come to encompass ourselves.

✧

Humanity's host, as we have seen, is multiple. Our species has become dependent upon numerous plant and animal species and a wide range of environmental resources. I have argued that in an extended but non-metaphorical sense, the world itself—the physical environment, its natural resources, and the diversity of life they support—has become the host of *Homo parasiticus*. At the same time, our species causes organic and environmental harm of a magnitude that is believed to be on a par with the most devastating massive destruction to life this planet has ever witnessed.

We are adaptable, resilient, and innovative—characteristics of successful parasite opportunism—which means that our anthropogenic impact is spread across a wide variety of biological niches. Viewed in terms of the Blitzkrieg hypothesis and the niche exclusion principle, our species' parasitism makes clear that, as long as the exploding human parasite population continues to kill other organisms and to evict those that survive from the habitats they require in order to live, our exterminator species will continue to set—and to *be*—the lethal levels for those species.

MAN, THE GLOBAL PATHOGEN

> The reality is as simple as it is dramatic: modern societies are preparing for a scene for suicide. With increasing speed and determination they are destroying the basis of life on earth: our own and that of many other species. – Otto Kinne in Ehrlich (1997:xiii)

In recent years, as we have seen, parasitology has awakened to ecology. Its enlarged focus is promising since it encourages a more inclusive comprehension of the destructive dynamic in which human beings are engaged. The ways in which our species interacts with the rest of the world involve human life on most levels: from the behavior of individuals in the privacy of their own bedrooms, to the behavior of businesses and nations seeking monetary profit and power. Homocentric values are the species' self-justification. Human parasitism is an individual and group psychological, social, political, and religious phenomenon. It finds its expression in the cult of motherhood, in the species' uncritical appetite for and infatuation with children, in beliefs that the earth and all other species exist for the pleasure and use of the human species. This last trait has been nurtured by species pride and its expression in religious dogma. Ecologist Paul Ehrlich (1997:37) has referred to it as "human exceptionalism," while biologist E. O. Wilson (1998) has similarly called man the "exemptionalist species": "In this conception, our species exists apart from the natural world and holds dominion over it. We are exempt from the iron laws of ecology that bind other species. Few limits on human expansion exist that our special status and ingenuity cannot overcome. We have been set free to modify Earth's surface...." (278)

Can mankind's parasitic relationship toward the world be changed? When by the end of this study we arrive at a more inclusive comprehension of the multiple forces that sustain the phenomenon of human parasitism, this question becomes harder, not easier, to answer. The changes that would be required are of such a magnitude, and penetrate to roots that run so deeply, as to make any kind of optimism unrealistic.

A difficult problem cannot be solved as long as the existence of the problem cannot be recognized. Naive hopefulness, rhetoric, sham, and species-induced denial block a clear perception of the ecological problem posed by the human species. We shall probably have to wait for the pressure of human overcrowding to build to a point that will force the issue upon human attention. But even then recognition is likely to dawn only gradually. For a time, the signs of overcrowding will not be recognized for what they are. In one imagined but realistic picture: "For a while the media will continue to ascribe riots and other violent upheavals abroad mainly to ethnic and religious conflicts. But as these conflicts multiply, it will become apparent that something else is afoot, making more and more places ungovernable." (Kaplan 1994:54) The perspective expressed in Meadows *et al.* (1992:66) is more moderate in tone, but similar: "Long before the ultimate limits are reached, the human race becomes economically, scientifically, aesthetically, and morally impoverished."

There are a number of possible futures for the accelerating proliferation of a parasite species. (See, e.g., Leslie 1996) One mechanism that it is important to recall is environmental resistance. Earlier in this chapter, I referred to this concept, which identifies ways in which a natural ecosystem may come to resist the pathological reproduction of a parasite. In the case of the human species, many of our activities are obviously coming full circle to harm us, in the form of conditions of environmental resistance that have an increasing potential to suppress the human population. Among possible examples, one can cite global warming, ozone layer depletion, the spreading effects of human toxic waste, and the evolution of increasingly virulent micro-pathogens, many of which are developing antibiotic resistance as a result of man's injudicious overuse of antibiotics. Each of these represents a way in which environmental resistance is developing to block the proliferation of the human species.

It is useful to mention another parallel between ecology and economics, as disciplines often evolve in tandem without the knowledge of their practitioners. The concept of environmental resistance has its counterpart within economics:

> An exponentially growing economy taking resources from and emitting wastes into a finite environment begins to stress that environment long before reaching ultimate limits. The environment then begins to send signals and pressures to the growing economy—signals of resource scarcity, pressures from accumulating wastes. Those signals and pressures are negative feedback loops. They seek to bring the economy into alignment with constraints of the surrounding system. That is, they seek to stop its growth. (Meadows *et al.* 1992:115-6)

The corresponding environmental pressures will, over time, inevitably restrain human population growth.

If we were capable of seeing the planet from a distance, we should see that *Homo parasiticus* possesses all of the defining attributes of a global pathogen, one which is in a very short span of time undermining the health of the world as a livable ecosystem. To call the species a global pathogen is to judge it to be an *ecological malignancy*.[12] It is to regard many of the effects of the species as signs of disease. This is not to engage in name-calling. The concepts of disease, pathology, and parasitism are themselves applicable when the conditions of their applicability are satisfied. This is a benign tautology, for diagnosis is precisely a procedure of applying a set of criteria to an observed state with an intent to recognize a harmful process. *Homo parasiticus* satisfies the criteria of a disease-producing species, a species that has come to act as a global ecological pathogen.

Toward the beginning of this chapter, I briefly described the concepts of parasitoidism and amensalism. We noted that, in parasitoidism, a parasite kills its host, while in a relationship of amensalism, one organism remains comparatively unaffected at the same time that the other is noticeably harmed. Competition and antibiosis, we recall, are two forms of amensalism. Competition deprives an organism of its conditions of life. Antibiosis inhibits another organism's growth, and may bring about its death.

We are now in a position to recognize that the human species is pathogenic in certain specific ways: For the enormous number of species that mankind pushes into extinction, and the countless individual organisms we daily harvest, slaughter, and butcher for food, hunt as a sport, crush beneath the wheels of our vehicles, and kill in a multitude of ways and for other reasons, the human species is parasitoidal. For numerous species, man is amensal, either because our species directly competes for land or the conditions of life, or because human activities are themselves antibiotic for surrounding forms of life, as human waste and toxins are released into the environment, natural land is paved over, etc.

To say that mankind is a pathogenic species in these ways is not to engage in the use of metaphor. There is no more rampant and concrete expression of parasitoidism and amensalism on earth than man's—and, as we have noted, there never has been, for no other species has ever wrought the amount and degree of destruction to other species and to the general conditions of life as has the human species. The reader will recall behavioral parasitism in which exploitative organisms appropriate from members of another species their requirements of life. This form of parasitism also characterizes the human species. The species is engaged in worldwide environmental exploitation in its own self-interest, exhibiting a degree and scope of behavioral parasitism unique among parasite species.

IN SUMMARY

The viewpoint we have taken in this chapter toward the human species involves three attitudes not routinely accepted by the lay public, but which are increasingly endorsed by the scientific community: (1) We have refused to acquiesce in our species' unquestioned and self-proclaimed centrism. (2) We have approached the phenomenon of

[12] One is reminded of a similar claim advanced almost half a century ago: "The world has cancer and the cancer is man." (Gregg 1955:681)

parasitism from an ecological perspective in which, (3) the concept of a parasite's host is understood in general systems terms, that is, as the interwoven network of interdependent associations the parasite species has with other species and with environmental conditions that sustain life.

Once these attitudes become part of our thinking about the natural world, it is not difficult to recognize that any ecosystem, even the encompassing ecosystem provided by the planet as a whole, can become diseased. In Part I of this book, we reached an understanding of disease in the specific sense of conditions and processes identified as harmful. Varieties of pathological harm were discussed, which result from individual or group organic, mental, social, or conceptual pathology. In the present chapter, my intention has been to identify and, in the space permitted, to some extent to clarify the nature of a widespread ecological pathology. It has resulted from a human psychology committed to the same goals shared by all parasite species: selfish, self-serving preservation, environmental exploitation, and reproduction at the expense of their respective hosts. The psychology of parasitism shares much with the psychology of narcissism, which previous chapters have discussed in a range of contexts, for in both parasitism and narcissism attention is confined to the immediacy of self-interest.

To see the human species in this way is to see mankind in a new light. We see the human species as one parasite species among many, recognizing that parasitism is the most pervasive way in which forms of life—from viruses to bacteria to protozoa to plants and animals—meet the exigencies of living. Among the defining characteristics of parasitism that apply to the human species, one in particular stands out as we consider the massive extinction of species for which mankind is currently responsible. It is genetic selfishness. In the human species, the genetic selfishness of the parasite has taken the form of our species' self-centeredness, our opportunistic exploitation of environmental resources, and our species' disregard of the degree to which human activity and reproduction displace and exterminate other forms of life.

The human species could, in a test of the imagination, approach the natural world differently. The opposite of parasitism is an approach to the world resembling altruism. If a species were altruistic in this sense, its behavior would involve acting in the interest of other species, even though doing so entails real cost to the altruist species. The cost that I am talking about would include self-restraint of our species' reproductive urges, a willingness to compromise its quality of living, etc.—all on behalf of species not its own.[13]

Such an unselfish species, as far as we know, does not exist in the world. If one ever has, its self-sacrificing nature would not lend itself to competition and natural selection, and as a result it is plausible to believe that it would soon die out in the evolutionary process. It falls to individuals and occasionally to social groups to express altruism, usually toward members of their own species, at times toward members of other species. Ironically, human individuals who are altruistic toward their fellow man often are not toward other species. For human intraspecific altruism often rests on religious grounds that ennoble man while construing all other species as his chattel. Though altruism evidently exists among some individuals and groups, on the species level per se, altruism appears not to exist or to have evolutionary promise.

Perhaps someday it will, but if and when it does, the existence of species altruism will be a radical departure from the powerful self-centered and self-serving interests that have been vested with such intensity in parasite species, and which have acted as the motive force behind many millions of years of organic evolution.

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[13] On the human psychological and conceptual resistance to altruism toward other species, see Bartlett (2002). One of the few ecologists courageous or idealistic enough to espouse this degree of species unselfishness has been biologist Dan Janzen, who has worked to conserve the diversity of species in Costa Rica's Guanacaste Conservation Area. Janzen has been one of the few to resist linking the desirability of survival of a species with its benefits to man, in a way that is reminiscent of Christopher D. Stone's respect for the legal rights of natural objects in the environment, independent of human interests, benefits, and profit. (Stone 1988/1972) Janzen has maintained: "Yes, you want to save this forest because you might find a new drug or new pest control or attract tourists, but none of these are [sic] the reason for wanting to keep this a wildland. For me, there's only one objective: that this biodiversity survive." (Morell 1999b:83)

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