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Sky Hiatt
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Natural Born Killers

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They say we are living through the 6th great mass extinction of non-human species here on Earth. As any calamity shifts the influence of power, that also means we've entered the 6th great age of the microbes. Conditions fatal to slowly evolving, relatively new species, such as our own, will prove beneficial, even ideal, for rapidly mutating ancient species such as virus and bacteria. These are the Earth's first and oldest living things, shadowed in Precambrian fossils 3.2 billion years old. Before them, there was nothing. For a billion years after them, there was nothing else. They prepared the Earth for all later life, but we tend to think of them as elemental things, sadly denied the dignity of consciousness. But when the calculus of cognition melts away, and the body assumes its most vulnerable form, the laws of organic order weaken. In fact, for bacteria and viruses, most laws of biology exist only to be broken.

"The war against infectious disease has been won," the U.S. Surgeon General famously proclaimed in 1969. That was before the passive-aggressive strategies of microbes threatened wonder-drugs and the utopia they hinted at. Medical professionals also predicted the end of specific diseases, such as T.B., which killed one million people a year in 1908 and today is the

second leading cause of death worldwide, killing three million annually. In the U.S., tuberculosis infections increased 20% in six years between 1985 and 1991. The war has not been won. When penicillin first saved a human life in 1942, an attending doctor commented later, "Nothing in my whole experience has ever compared to that." Another witness was equally stunned. "It was a truth so gratifying as to be at times almost unbelievable." The age of antibiotics was begun. In *Why We Get Sick*, authors Randolph Ness and George Williams refer to antibiotics as "Perhaps the greatest medical advance of the century and one of the greatest of all time..." Death was defeated. Science reigned. Within three years, resistances appeared. The microbes quickly learned how to disable the new drug therapies. In 1998, for the first time in 56 years, a hospital patient died of an untreatable staphylococcus infection. Today 90% of hospital staph infections have resistances to all antibiotics but one—vancomycin—also known as the drug of last resort. The golden age is over.

Vancomycin resistant Enterococcus. VISA—vancomycin intermediate resistant *Staphylococcus aureus*. The phenomenon has been institutionalized. New areas of specialization are appearing. Summits are held to focus on a problem that could push us into the "post-antibiotic age." To avert a crisis, they will have to alter the course of contemporary reality. As long ago as 1996, the World Health Organization issued warnings of "a major *plague* for the coming century." Truthfully, plague already sounds major to me. WHO narrowed the potential microbial culprits to T.B., cholera, AIDS, diphtheria, polio. If the crisis cannot be averted, infectious disease will continue spreading, pandemics will rise, every surgical procedure will be as dangerous as it was in 1920 and elective surgery will be unheard of. In *The Dancing Matrix; Voyages Along the Viral Frontier* Robin Henig summarizes, "The single biggest threat to man's continued dominance of the planet, is the virus."

Health, illness and the Social Body, by Peter E.S. Fruend and Meredith B. McGuire
Health and the Rise of Civilization, by Mark Nathan Cohen
Herb Growing for Health, by Donald Law
The Hot Zone, by Richard Preston
Killer Germs, by David and Barry Zimmerman
The Killers Within, by Michael Shnayerson and Mark J. Plotkin
The Last Oasis, by Sandra Postel
Man and Microbes, by Arno Karlen
Mirage of Health, by René Dubos
Natural History Magazine, 2-99
The Next 50 Years, edited by John Brockman
Our Final Hour, by Martin Reese
Overkill, by Dr. Kimberly M. Thompson
Parasite Rex, by Carl Zimmer
Viruses, by Arnold Levine M.D.
The Virus Realm, by Paul D. Thompson
Why We Get Sick, by Randolph M. Ness M.D. and George C. Williams, Ph.D

Despite the notoriety, viruses are absent from taxonomic inventories. They aren't alive exactly, just elemental protein strings that need a host cell to replicate. Maybe that's why they don't know fear, don't get tired or confused, or angry or impatient. Maybe that's why they're not programmed to give up, cede or surrender. According to researcher Glenn Morris, "These are bugs that spend every second of their lives trying to protect themselves and replicate." There is no down time. Their cousins, the bacteria, can exist breathing sulfide, oxygen, methane, ammonia, carbon monoxide, inert nitrogen. They can live comfortably in boiling water, acid, ice, and desert dryness, suspending life's functions waiting for a drop of rain.

Things were different on Earth when viruses and bacteria appeared. Times were hard. The young planet was an unreceptive, lethal environment, possibly satisfied to smolder forever as molten rock devoid of life. It was not necessarily guaranteed that species would appear at all, or survive. Any form of life, in that world, would have to be inconceivably resilient. They would have to be almost indestructible.

Compared to the Precambrian, civilization has been a cornucopia for them. Everything we do threatens us and favors them. Global warming, colonialism, chronic change, pollution, cities, ozone depletion, refugees, poverty, prostitution, wealth, war, dams, homelessness, prisons, prison camps, drug-addiction, animal-based agriculture, garbage dumps, irrigation. "The scale of disease associated with irrigation is massive," writes Sandra Postel in *The Last Oasis*. Hot water systems, humidifiers, air-conditioning. Legionnaires (X) Disease started in the A/C of a conference center and is now a threat worldwide. Microbes favor the tepid artificial ponds of modernity. Soil bacteria, we now know, do well in high-tech cooling equipment. International trade and travel? Paul Reston writes about this in *The Hot Zone*. A "virus from the rainforest is now within 24 hours of every city on Earth—Paris, Rome, New York — wherever planes fly." Bacteriologists call it viral

trafficking along the viral highway. Laurie Garrett calls it the globalization of microbes. Researchers and doctors who gather to consider the intensifying health crises, are going to have to think about all these things. Maybe eventually they'll realize civilization is a disease machine.

Our manifest imperialist destiny has liberated bacteria whose lethal threats were once held off by acquired ecosystems immunities. Wildness once offered protection to everyone. In stable times, one species became extinct and one appeared, on the average, every million years. During those times, species in each bioregion grew habituated to one another. Compatibility was the first law and it has never been rescinded. Pathogens and hosts once lived together. Auto-immune harmony prevailed. If anything moved out of the protective eco-cluster, it risked death head-on. If new organisms came in, most were soon exterminated. For every 1000 life forms that appeared on Earth only one survived. Stability, continuity, and permanence have always been the laws of being alive. Of course, we've long suspected the bugs and germs would thrive in a post-apocalyptic world. But, did we see them as the apocalypse? If an airborne transmissible form of AIDS appears, according to Arno Karlen, we're probably doomed. All the virus has to do is migrate to the lungs, where its deadly properties can be spread by merely breathing on someone. There are no laws of biology preventing that from happening.

Certainly civilizations existed long before antibiotics and many survived to modern times. Of those that failed, they failed for different reasons, in relative isolation in their bioregion. It took technology to break down the protective limits, so that each threat to one becomes a threat to all. Before tourism, sailing ships and airplanes, if past cultures encountered novel pathogens, the damage would be localized. As today's societies are all connected, civilization as a whole is threatened. The global village is hostile and uncompromising.

"Disarmament is not an option." This is a world in which streptomycin has become a nutrient to the bacteria we are at war with.

The solution to our health crisis will not be discovered through the lens of the electron-scanning microscope. To defeat the germs, we need to lay down the weapons of technology, retreat into the forest and leave the wreckage of civilization behind us. If we can live there in Nature, in relatively small groups of closely aligned people committed to a geographic domain, living as simply as possible, as primitively as possible, living wild, without war, without agriculture, without cities—if we can do that and disaster or upheaval doesn't intervene, myths of Earthly sanctuary are as close as they ever will be to coming true. "Disease is life under changed conditions," Florence Nightengale said. "There are no specific diseases, only specific disease conditions."

In the closing paragraph of *Viruses*, Arnold Levine writes: "That special relationship between host and parasite will continue to make human beings—and all forms of life on Earth—what we are and what we will be. It is important for us to know the rules." I agree.

SOURCES:

The Antibiotic Paradox, by Stuart Levy M.D.

Beyond Antibiotics, by Schmidt, Smith and Schnort

Beyond Vancomycin, Science News, vol. 155, p. 268-269, Corinna Wu.

Bioevolution, by Michael Fumento

The Coming Plague, by Laurie Garrett

A Dancing Matrix— Voyages Along the Viral Frontier, by Robin Henig (x)

Deadly Feast, by R. Rhodes

The Future in Plain Sight, by Eugene Linden

Garden of Microbial Delights, by Sagan and Margulis

A Green History of the World, by Clive Ponting

Guns, Germs and Steel, by Jared Diamond

We are left on our own to face the challenge of recapturing robust, evolved immunities and the primal health dynamic. Our ancestors had already paid for it in full. But the bond has been broken.

What's happening is, the old diseases initially declined through the use of antibiotics. During that same time, the 'diseases of civilization' surfaced: heart disease, cancer, diabetes, obesity, etc. Then the original diseases began reemerging, often in more virulent forms. And now new infectious diseases, emerging diseases, are appearing, superimposed on all the rest. That's the path we're on. But most researchers continue looking for the real magic bullet. In some circles, optimism persists. In his recent book *Bioevolution*, Michael Fumento predicts that the future achievements of genetic engineering will include the end of most diseases, increases in human life-span, higher crop yields and soil fertility, restoration of the environment, the end of malnutrition, plant diseases wiped out. In *The Next 50 Years*, John Brockman writes "...we will almost certainly be able to produce artificial immune systems that can counter both living viruses and computer viruses." Nanotechnology will "...provide habitats to protect us from our own ecological misdemeanors..." James Watson of double helix fame once said, "If biologists won't play god, who will?" Apparently he has followers: immortalists, transhumanists, cryonicists.

Could we ever stop the microbial masses in their tracks? Well, the laws of probability are not on our side. We've put a man on the Moon. Developed nuclear weaponry. If we could have stopped the microbes, it seems as though, by now, we would have done it. No, this world will never be healthy. Civilization lacks the innate qualities. It is structurally flawed. No matter how secure we may feel in the antiseptic isolation chamber of the present, no matter how many CAT scans, MRIs, EKGs, or novel drugs we consume, it will not happen. "We are in an arms race," write the authors of *The Killers Within*.

Errors are "magnified worldwide." While humans focus on oil wars, marauding weather systems, mutant frogs, and world hunger, the microbes persevere in their inexorable conquest of the planet.

The Yellow Fever mosquito vectors usually live in forest and jungle canopies preying on monkeys and small animals. When they cut the trees, the mosquitoes came down. Now they share their microbes with humans. Along the way they developed resistances to DDT. If you burn the forests of Borneo, the fruit bats may turn to nearby farms and pass on pathogens to the livestock, which may pass them on to farmers. If you kill all the gazelle, the tsetse fly will go elsewhere. If you build subdivisions in the eastern U.S. forests, deer will be pressed nearer to your yards and homes. Deer ticks may be transferred to pets, which may pass on Lyme Disease to humans. As humans overpopulate, the more the microbes focus on us. We're depleting their former victim populations, while offering human hosts with virgin immune systems to prey upon. At present, there are 5,000 vials of exotic viruses from the Amazon rain forest freeze-dried in a Yale lab waiting for someone to take a look at them. This is only a fraction of the populations of bacteria and viruses waiting in their equanimity zones for us to stumble upon them. Consider the compulsiveness with which scientists take care to insure no alien bacteria are brought back to Earth from deep space missions, and the estimated two million bacteria of earthly origin still waiting to be encountered, studied and characterized. The potentially catastrophic hazard was here all along. "If we had discovered them on Mars," write Sagan and Margulis, "they would have received the attention they deserve." Every time we enter a virgin forest to destroy it or exploit it, we are stepping from a lunar landing module onto alien terrain.

Forests may passively allow their destruction, seas die quietly, and mammals, fish, and birds fade into extinction. Bacteria are not like that. They redefine the paradigm of life into rigid

dictums coded in the chemical combinations and random genetic variations of their own design. We followed their rules for eons, from Australopithecus to the age of iron. But, the present age has deterred us. So much so, that the end of the fossil fuel era, a new ice age triggered by global warming, overpopulation, water wars—all of this is distant future history. According to the Earth's oldest living things, civilization will never make it that far.

What scientists now understand about bacteria is, you can kill them, but you can never kill them all. Among the teeming millions found in the head of a pin, genetic variety naturally exists. The antibiotics select for those few by killing all the rest. New antibiotics have to be synthesized for these survivors, and so it goes. By now, worldwide multiple drug-resistant (MDR) bacteria are returning and Old-World diseases are on the rise. The diseases of yesterday? Except for smallpox, there is no such thing. Most are returning. Cholera—there are now 139 strains on record. Measles, gonorrhea, plague, typhus, T.B., malaria, diphtheria, yellow fever, dengue fever, scarlet fever—the old-fashioned strain was wiped out, now a new, heartier version has returned and killed. Rheumatic fever, the black death, dysentery. Leprosy has evolved untreatable new strains. Syphilis infects more people today than in the 1950's. Emerging diseases are also on the rise: Marburg, Ebola, AIDS, HSE, Kuru, CJD, Lassa fever, West Nile virus. Wasting diseases, lingering diseases. In *Health, Illness, and the Social Body*, Fruend and McGuire write, "Chronic, degenerative diseases increase as populations move from hunter-gatherer to agriculture to the industrial community." This works well for pharmaceuticals, who prefer to manufacture drugs that will be taken for forty years, rather than those that will be used episodically, rarely or never.

In *The Future in Plain Sight*, Eugene Linden refers to cities as, "The ideal nurseries for incubating more virulent forms of disease." They are the contemporary plague zones. The

shorter life-span than the present one [depending on access to life-extending technologies].

Destabilizing adjacent ecosystems for the benefit of one species is biocultural deficit spending. Anything deserving of acclaim cannot be good for one species to the detriment of all the rest. Eventually the debt comes due and your empire of domination will fall. All-out war on Nature is not the pathway to health. Genuine gains must obey planetary edict.

As far as records indicate, no age in history has ever spent so much money on health and healing as the present one. No age has ever had to.

From *Herb Growing for Health*, by Donald Law.

In the 21st century, concentrated populations all share the same needle, and are infected with the same disease. They share a pact of similar destinies—the lethal injections of modernity. Fair trade means trading in everything. Nikes, Pepsi, movies, new diseases, old diseases, everything. The old illnesses are on the rise everywhere. New ones are emerging everywhere. Antibiotic resistance is happening everywhere. Infectious disease is up 20% in the last 20 years—not in the third world, but in the U.S. Why haven't the microbes taken over the Earth? Well, haven't you been listening?

The bad news is, our genetic memories have been erased. The black box of civilization has disrupted the evolutionary health processes with an array of medical armaments behind which we, barely evolving, wither and atrophy. Natural health has been disrupted. Hard-won species gains have been erased across a wide spectrum and we've regressed toward immunological vulnerability. Our bodies can identify and attack one million foreign proteins. But only if we are exposed to them. Science doesn't let that happen. Now we have "the Hygiene Hypothesis", the theory that our immune systems are so underused they cannot respond effectively to the world around us.

microbe in their daily lives. Today, vaccinations—recently linked to ADHD and autism—are dispensed in doctor's offices setting up a dependency so that, should regular vaccinations become unavailable for any reason, those born after that time will not be protected against future outbreaks. This matters because, although they've wiped out the disease, smallpox isn't really gone. Reserves are held in labs in Russia and the U.S. as a safeguard to develop vaccines against potential bio-terrorism. Some of these high-risk samples have already come up missing. And estimates are that at least a dozen "rogue nations" harbor illegal stocks of smallpox virus. This is not quite news. The U.S. weaponized anthrax, as well as a form of botulism 10,000 times as virulent as nerve gas. They were going to use it on Cuba, but changed their minds. Eight ounces could have wiped out all humanity. Is it still on the shelf? Who knows? Historically, biologic weapons treaties are broken by everyone who signs them.

Workers in the field agree, "The potential for bio-terrorism is limitless." In *Our Final Hour*, Martin Reese writes, "Disaster could be caused by someone who is merely incompetent rather than malign." Potential bio-terrorists may have already taken note that smallpox vaccinations were discontinued in the U.S. in 1972, since, by then, more people were dying from the vaccine than from the virus. So, if smallpox were used as a weapon here, many Americans would be vulnerable. Maybe the terrorists are just watching the clock. The longer they wait, the larger the percentage of the population unprotected.

As we have seen, there are crucial limits to vaccines and antibiotics. Prospects of longevity, however, have no doubt won more converts to civilization than any other achievement of our times. Drug therapies were maximized, the sick were cured, infectious disease quelled into submission, life-spans soared. But those gains were artificial—an unsustainable anomaly of the present. In fact, it has recently been reported that for the first time in American history, the next generation will have a

world's first sedentary agriculturalists, and later colonialists, pulled whole populations off ancestral lands, into growing urban centers. Arno Karlen calls cities "superherds of humans," where pathogens can intermingle and interbreed freely. Sick building syndrome is a modern problem. Synthetic compounds leach into the recirculated 'canned air' of offices cut off from the outside atmosphere. Germs revel in it. The inner city is a third world anti-oasis, where outbreaks of MDR T.B. are difficult to eradicate. The homeless often fail to complete the lengthy treatments necessary. Cities breached ancient health parameters and gave rise to 'crowd diseases,' those infectious marauders in need of constant new victims to sustain them. This is the "threshold effect" by which increasingly urbanized populations reach critical levels, permitting new infections to spread continuously. Measles, mumps, colds, flu, smallpox—all need large populations, endless supplies of new victims lacking tolerances or immunities, to sustain them. All organisms in a given cluster would have either died out or developed immunities. In primal times, such diseases and the epidemics they fostered were impossibilities.

The remaining threats of modernity? Global warming sends disease vectors migrating northward prospering in the warmer climates reminiscent of the ancient warmer Earth. Ozone depletion may be inconsequential to bacteria since they created the Earth's oxygen, which the Sun converted to ozone, but not before the microbes became resistant to the effects of radiation. Poverty offers microbes millions of compromised hosts as helpless victims. As the ranks of the poor increase worldwide, disease spreads among them. Refugees, now 20 million strong globally, are distressed human super-herds spreading disease among them. AIDS forms a deadly triad with syphilis and tuberculosis. Suppressed immunities are ideal sanctuaries where old diseases are reborn as unconquerable adversaries, indifferent to our drugs and vast technologies. Drug-addiction

introduces reused needles – proficient disease vectors standing in for mosquitoes, ticks, contaminated water.

War is a microbial nirvana zone. Favored elements are on hand simultaneously: filth, open wounds, strangers thrown together in unknown lands. “Four out of five fatalities in WWII were from infections, not from the wounds,” write the Zimmers in *Killer Germs*. In WWI, three million died from typhus alone. The avian flu has recently (Feb, 15, 06) moved into Africa, Greece, Italy, and Bulgaria. Birds will fly. Epidemiologists are plotting the migration routes. The bird flu has also entered Iraq. Maybe the smell of explosives will nudge it into that final mutation allowing it to spread contagiously from human to human. Then, returning American troops could effectively spread the disease among us. In that case, there could be a reevaluation of their mission there.

As civilization advanced, even food has served as a convenient disease vector. The first proto-humans ate primarily plant food as evidenced by grinding molars and the long intestine. Next, early humans began scavenging meat killed by other animals. Third, came hunter-gatherer status. Then, animal-based agriculture. And finally, factory farming. Through the first stages, humans advanced beyond the tropics taking on new diseases in exchange for the calories to feed the global population expansion. Animal-based agriculture pressed humans into closer association to other species, themselves now sedentary, accelerating the incidence of disease crossover. We now know that all infectious diseases come to us from animals. Sixty-five diseases from dogs—distemper in dogs is caused by a virus that jumped to humans as measles. Thirty-five diseases from horses including the common cold. Forty-six from sheep and goats. One-hundred from birds including the quickly mutating avian flu with a 50% fatality rate in humans so far. The flu pandemic of 1918 only killed one in a thousand. Millions died. Of a potential modern avian flu pandemic, author Laurie Garrett says the only thing she can think of that

would be worse would be nuclear war. Cholera, hantavirus, typhus and various plagues, from rodents that have followed humans into their urban sanctuary. There are 129 strains of cholera now on record—the microbe is an opportunist lurking in the contaminated waters of the third world. Forty-two diseases from pigs. Leprosy—from tanning water buffalo hides. From monkeys we get Ebola, and Marburg—a disease so lethal researchers risk their lives working on it. Fifty diseases from cattle including T.B. and smallpox—the one bacteria science claims to have wiped out.

Our relationship to animals has shaped the world, almost promising it would become civilized. With the disease load from animal-based agriculture, it was ordained the Europeans would defeat the New World natives. Indigenous hunter-gatherers and gardeners had a more distant relationship to animals, and so, few infectious diseases to share and no immune tolerances to the conqueror’s microbial inventory. The pioneers may not have really needed other weapons. It is said many villages were decimated before the conquerors even reached them, as the microbes spread ahead reshaping history. In *Health and the Rise of Civilization*, Mark Nathan Cohen writes, “Meat is the most dangerous source of food-borne infection.” Not only historic diseases, but also many emerging infectious diseases are coming to us this way. It’s as though each animal were a kingdom unto itself— a universe of alien bacteria wrapped in skin. Carnivores have evolved tolerances to the kingdom bodies of other beings. But, for humans, the hazards of eating meat have helped push humans to their present level of socio-cultural incompetence.

After decimating Indian populations, smallpox went on to become the only disease science can take credit for wiping out. Vaccinations—disabled versions of the virus, did the job. Vaccinations are not an invention of the present, but have been around since ancient times. In those days, however, humans were naturally exposed to nonlethal versions of the