

THE WORLD WITHOUT US



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THOMAS DUNNE BOOKS

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*Das Firmament blaut ewig, und die Erde
Wird lange fest steh'n und aufblüh'n im Lenz.
Du aber, Mensch, wie lange lebst denn du?*

The firmament is blue forever, and the Earth
Will long stand firm and bloom in spring.
But, man, how long will you live?

—Li-Tai-Po/Hans Bethge/Gustav Mahler
*The Chinese Flute:
Drinking Song of the Sorrow of the Earth
Das Lied von der Erde*

consumed all day in the form of *chicha*. The Zápara had survived into the 21st century, but they had entered it tipsy, and stayed that way.

They still hunted, but men now walked for days without finding tapirs or even quail. They had resorted to shooting spider monkeys, whose flesh was formerly taboo. Again, Ana María pushed away the bowl proffered by her granddaughters, which contained chocolate-colored meat with a tiny, thumbless paw jutting over its side. She raised her knotted chin toward the rejected boiled monkey.

"When we're down to eating our ancestors," she asked, "what is left?"

So far from the forests and savannas of our origins, few of us still sense a link to our animal forebears. That the Amazonian Zápara actually do is remarkable, since the divergence of humans from other primates occurred on another continent. Nevertheless, lately we have had a creeping sense of what Ana María means. Even if we're not driven to cannibalism, might we, too, face terrible choices as we skulk toward the future?

A generation ago, humans eluded nuclear annihilation; with luck, we'll continue to dodge that and other mass terrors. But now we often find ourselves asking whether inadvertently we've poisoned or parboiled the planet, ourselves included. We've also used and abused water and soil so that there's a lot less of each, and trampled thousands of species that probably aren't coming back. Our world, some respected voices warn, could one day degenerate into something resembling a vacant lot, where crows and rats scuttle among weeds, preying on each other. If it comes to that, at what point would things have gone so far that, for all our vaunted superior intelligence, we're not among the hardy survivors?

The truth is, we don't know. Any conjecture gets muddled by our obstinate reluctance to accept that the worst might actually occur. We may be undermined by our survival instincts, honed over cons to help us deny, defy, or ignore catastrophic portents lest they paralyze us with fright.

If those instincts dupe us into waiting until it's too late, that's bad. If they fortify our resistance in the face of mounting omens, that's good. More than once, crazy, stubborn hope has inspired creative strokes that snatched people from ruin. So, let us try a creative experiment: Suppose that the worst has happened. Human extinction is a fait accompli. Not by nuclear calamity, asteroid collision, or anything ruinous enough to also

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wipe out most everything else, leaving whatever remained in some radically altered, reduced state. Nor by some grim eco-scenario in which we agonizingly fade, dragging many more species with us in the process.

Instead, picture a world from which we all suddenly vanished. Tomorrow.

Unlikely perhaps, but for the sake of argument, not impossible. Say a *Homo sapiens*-specific virus—natural or diabolically nano-engineered—picks us off but leaves everything else intact. Or some misanthropic evil wizard somehow targets that unique 3.9 percent of DNA that makes us human beings and not chimpanzees, or perfects a way to sterilize our sperm. Or say that Jesus—more on Him later—or space aliens rapture us away, either to our heavenly glory or to a zoo somewhere across the galaxy.

Look around you, at today's world. Your house, your city. The surrounding land, the pavement underneath, and the soil hidden below that. Leave it all in place, but extract the human beings. Wipe us out, and see what's left. How would the rest of nature respond if it were suddenly relieved of the relentless pressures we heap on it and our fellow organisms? How soon would, or could, the climate return to where it was before we fired up all our engines?

How long would it take to recover lost ground and restore Eden to the way it must have gleamed and smelled the day before Adam, or *Homo habilis*, appeared? Could nature ever obliterate all our traces? How would it undo our monumental cities and public works, and reduce our myriad plastics and toxic synthetics back to benign, basic elements? Or are some so unnatural that they're indestructible?

And what of our finest creations—our architecture, our art, our many manifestations of spirit? Are any truly timeless, at least enough so to last until the sun expands and roasts our Earth to a cinder?

And even after *that*, might we have left some faint, enduring mark on the universe; some lasting glow, or echo, of Earthly humanity; some interplanetary sign that once we were here?

For a sense of how the world would go on without us, among other places we must look to the world before us. We're not time travelers, and the fossil record is only a fragmentary sampling. But even if that record were complete, the future won't perfectly mirror the past. We've ground some

species so thoroughly into extinction that they, or their DNA, will likely never spring back. Since some things we've done are likely irrevocable, what would remain in our absence would not be the same planet had we never evolved in the first place.

Yet it might not be so different, either. Nature has been through worse losses before, and refilled empty niches. And even today, there are still a few Earthly spots where all our senses can inhale a living memory of this Eden before we were here. Inevitably they invite us to wonder how nature might flourish if granted the chance.

Since we're imagining, why not also dream of a way for nature to prosper that doesn't depend on our demise? We are, after all, mammals ourselves. Every life-form adds to this vast pageant. With our passing, might some lost contribution of ours leave the planet a bit more impoverished?

Is it possible that, instead of heaving a huge biological sigh of relief, the world without us would miss us?

CHAPTER 2



Unbuilding Our Home

"If you want to destroy a barn,' a farmer once told me,
'cut an eighteen-inch-square hole in the roof.
Then stand back.'"

—architect Chris Riddle
Amherst, Massachusetts

ON THE DAY after humans disappear, nature takes over and immediately begins cleaning house—or houses, that is. Cleans them right off the face of the Earth. They all go.

If you're a homeowner, you already knew it was only a matter of time for yours, but you've resisted admitting it, even as erosion callously attacked, starting with your savings. Back when they told you what your house would cost, nobody mentioned what you'd also be paying so that nature wouldn't repossess it long before the bank.

Even if you live in a denatured, postmodern subdivision where heavy machines mashed the landscape into submission, replacing unruly native flora with obedient sod and uniform saplings, and paving wetlands in the righteous name of mosquito control—even then, you know that nature wasn't fazed. No matter how hermetically you've sealed your temperature-tuned interior from the weather, invisible spores penetrate anyway, exploding in sudden outbursts of mold—awful when you see it, worse when you don't, because it's hidden behind a painted wall, munching paper sandwiches of gypsum board, rotting studs and floor joists. Or you've been colonized by termites, carpenter ants, roaches, hornets, even small mammals.

Most of all, though, you are beset by what in other contexts is the veritable stuff of life: water. It always wants in.

After we're gone, nature's revenge for our smug, mechanized superiority arrives waterborne. It starts with wood-frame construction, the most widely used residential building technique in the developed world. It begins on the roof, probably asphalt or slate shingle, warranted to last two or three decades—but that warranty doesn't count around the chimney, where the first leak occurs. As the flashing separates under rain's relentless insistence, water sneaks beneath the shingles. It flows across four-by-eight-foot sheets of sheathing made either of plywood or, if newer, of woodchip board composed of three- to four-inch flakes of timber, bonded together by a resin.

Newer isn't necessarily better. Wernher Von Braun, the German scientist who developed the U.S. space program, used to tell a story about Colonel John Glenn, the first American to orbit the Earth. "Seconds before lift-off, with Glenn strapped into that rocket we built for him and man's best efforts all focused on that moment, you know what he said to himself? 'Oh, my God! I'm sitting on a pile of low bids!'"

In your new house, you've been sitting under one. On the one hand, that's all right: by building things so cheaply and lightly, we use fewer of the world's resources. On the other hand, the massive trees that yielded the great wooden posts and beams that still support medieval European, Japanese, and early American walls are now too precious and rare, and we're left to make do with gluing together smaller boards and scraps.

The resin in your cost-conscious choice of a woodchip roof, a waterproof goo of formaldehyde and phenol polymer, was also applied along the board's exposed edges, but it fails anyway because moisture enters around the nails. Soon they're rusting, and their grip begins to loosen. That presently leads not only to interior leaks, but to structural mayhem. Besides underlying the roofing, the wooden sheathing secures trusses to each other. The trusses—premanufactured braces held together with metal connection plates—are there to keep the roof from splaying. But when the sheathing goes, structural integrity goes with it.

As gravity increases tension on the trusses, the ¼-inch pins securing their now-rusting connector plates pull free from the wet wood, which now sports a fuzzy coating of greenish mold. Beneath the mold, threadlike filaments called hyphae are secreting enzymes that break cellulose and lignin down into fungi food. The same thing is happening to the floors

inside. When the heat went off, pipes burst if you lived where it freezes, and rain is blowing in where windows have cracked from bird collisions and the stress of sagging walls. Even where the glass is still intact, rain and snow mysteriously, inexorably work their way under sills. As the wood continues to rot, trusses start to collapse against each other. Eventually the walls lean to one side, and finally the roof falls in. That barn roof with the 18-by-18-inch hole was likely gone inside of 10 years. Your house's lasts maybe 50 years; 100, tops.

While all that disaster was unfolding, squirrels, raccoons, and lizards have been inside, chewing nest holes in the drywall, even as woodpeckers rammed their way through from the other direction. If they were initially thwarted by allegedly indestructible siding made of aluminum, vinyl, or the maintenance-free, portland-cement-cellulose-fiber clapboards known as Hardie planks, they merely have to wait a century before most of it is lying on the ground. Its factory-impregnated color is nearly gone, and as water works its inevitable way into saw cuts and holes where the planks took nails, bacteria are picking over its vegetable matter and leaving its minerals behind. Fallen vinyl siding, whose color began to fade early, is now brittle and cracking as its plasticizers degenerate. The aluminum is in better shape, but salts in water pooling on its surface slowly eat little pits that leave a grainy white coating.

For many decades, even after being exposed to the elements, zinc galvanizing has protected your steel heating and cooling ducts. But water and air have been conspiring to convert it to zinc oxide. Once the coating is consumed, the unprotected thin sheet steel disintegrates in a few years. Long before that, the water-soluble gypsum in the sheetrock has washed back into the earth. That leaves the chimney, where all the trouble began. After a century, it's still standing, but its bricks have begun to drop and break as, little by little, its lime mortar, exposed to temperature swings, crumbles and powders.

If you owned a swimming pool, it's now a planter box, filled with either the offspring of ornamental saplings that the developer imported, or with banished natural foliage that was still hovering on the subdivision's fringes, awaiting the chance to retake its territory. If the house's foundation involved a basement, it too is filling with soil and plant life. Brambles and wild grapevines are snaking around steel gas pipes, which will rust away before another century goes by. White plastic PVC plumbing has yellowed and thinned on the side exposed to the light, where its chloride is

weathering to hydrochloric acid, dissolving itself and its polyvinyl partners. Only the bathroom tile, the chemical properties of its fired ceramic not unlike those of fossils, is relatively unchanged, although it now lies in a pile mixed with leaf litter.

After 500 years, what is left depends on where in the world you lived. If the climate was temperate, a forest stands in place of a suburb; minus a few hills, it's begun to resemble what it was before developers, or the farmers they expropriated, first saw it. Amid the trees, half-concealed by a spreading understory, lie aluminum dishwasher parts and stainless steel cookware, their plastic handles splitting but still solid. Over the coming centuries, although there will be no metallurgists around to measure it, the pace at which aluminum pits and corrodes will finally be revealed: a relatively new material, aluminum was unknown to early humans because its ore must be electrochemically refined to form metal.

The chromium alloys that give stainless steel its resilience, however, will probably continue to do so for millennia, especially if the pots, pans, and carbon-tempered cutlery are buried out of the reach of atmospheric oxygen. One hundred thousand years hence, the intellectual development of whatever creature digs them up might be kicked abruptly to a higher evolutionary plane by the discovery of ready-made tools. Then again, lack of knowledge of how to duplicate them could be a demoralizing frustration—or an awe-arousing mystery that ignites religious consciousness.

If you were a desert dweller, the plastic components of modern life flake and peel away faster, as polymer chains crack under an ultraviolet barrage of daily sunshine. With less moisture, wood lasts longer there, though any metal in contact with salty desert soils will corrode more quickly. Still, from Roman ruins we can guess that thick cast iron will be around well into the future's archaeological record, so the odd prospect of fire hydrants sprouting amidst cacti may someday be among the few clues that humanity was here. Although adobe and plaster walls will have eroded away, the wrought iron balconies and window grates that once adorned them may still be recognizable, albeit airy as tulle, as corrosion eating through the iron encounters its matrix of indigestible glass slag.

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Once, we built structures entirely from the most durable substances we knew: granite block, for instance. The results are still around today to admire, but we don't often emulate them, because quarrying, cutting, transporting, and fitting stone require a patience we no longer possess. No one since the likes of Antoni Gaudí, who began Barcelona's yet-unfinished Sagrada Familia basilica in 1880, contemplates investing in construction that our great-great-grandchildren's grandchildren will complete 250 years hence. Nor, absent the availability of a few thousand slaves, is it cheap, especially compared to another Roman innovation: concrete.

Today, that brew of clay, sand, and a paste made of the calcium of ancient seashells hardens into a man-made rock that is increasingly the most affordable option for *Homo sapiens urbanus*. What happens, then, to the cement cities now home to more than half the humans alive?

Before we consider that, there's a matter to address regarding climate. If we were to vanish tomorrow, the momentum of certain forces we've already set in motion will continue until centuries of gravity, chemistry, and entropy slow them to an equilibrium that may only partly resemble the one that existed before us. That former equilibrium depended on a sizeable amount of carbon locked away beneath Earth's crust, much of which we've now relocated into the atmosphere. Instead of rotting, the wood frames of houses may be preserved like the timbers of Spanish galleons wherever rising seas pickle them in salt water.

In a warmer world, the deserts may grow drier, but the parts where humans dwelled will likely again be visited by what attracted those humans in the first place: flowing water. From Cairo to Phoenix, desert cities rose where rivers made arid soils livable. Then, as population grew, humans seized control of those aquatic arteries, diverting them in ways that allowed for even more growth. But after people are gone, the diversions will soon follow them. Drier, hotter desert climates will be complemented by wetter, stormier mountain weather systems that will send floods roaring downstream, overwhelming dams, spreading over their former alluvial plains, and entombing whatever was built there in annual layers of silt. Within them, fire hydrants, truck tires, shattered plate glass, condominiums, and office buildings may remain indefinitely, but as far from sight as the Carboniferous Formation once was.

No memorial will mark their burial, though the roots of cottonwoods,

willows, and palms may occasionally make note of their presence. Only eons later, when old mountains have worn away and new ones risen, will young streams cutting fresh canyons through sediments reveal what once, briefly, went on here.

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AS THE SAYING goes, we don't get out of this life alive—and neither will the Earth. Around 5 billion years from now, give or take, the sun will expand into a red giant, absorbing all the inner planets back into its fiery womb. At that point, water ice will thaw on Saturn's moon Titan, where the temperature is currently -290°F , and some interesting things may eventually crawl out of its methane lakes. One of them, pawing through organic silt, might come across the Huygens probe that parachuted there from the Cassini space mission in January, 2005, which, during its descent, and for 90 minutes before its batteries died, sent us pictures of streambed-like channels cutting down from orange, pebbled highlands to Titan's sand-dune seas.

Sadly, whatever finds Huygens won't have any clue where it came from, or that we once existed. Bickering among project directors at NASA nixed a plan to include a graphic explanation that Jon Lomberg designed, this time encased in a diamond that would preserve a shred of our story at least 5 billion years—long enough for evolution to provide another audience.

More crucial to us still here on Earth, right now, is whether we humans can make it through what many scientists call this planet's latest great extinction—make it through, and bring the rest of Life with us rather than tear it down. The natural history lessons we read in both the fossil and the living records suggest that we can't go it alone for very long.

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Various religions offer us alternative futures, usually elsewhere, although Islam, Judaism, and Christianity mention a messianic reign on Earth lasting, depending on whose version, somewhere from seven to 7,000 years. Since these would apparently follow events that result in severe population reduction of the unrighteous, this might be feasible. (Unless, as all three suggest, the dead would be resurrected, which could trigger both resource and housing crises.)

However, since they disagree about who are the righteous, to believe any one of them requires an act of faith. Science offers no criteria by which to pick survivors other than evolution of the fittest, and into every creed are born similar percentages of stronger and weaker individuals.

As to the fate of the planet and its other residents after we're finally done with it—or it's done with us—religions are dismissive, or worse. The posthuman Earth is either ignored or destroyed, although in Buddhism and Hinduism, it starts again from scratch—as does the whole universe, similar to a repeating Big Bang theory. (Until that happens, the correct answer to whether this world would go on without us, says the Dalai Lama, is: "Who knows?")

In Christianity, the Earth melts, but a new one is born. Since it needs no sun—the eternal light of God and the Lamb having eliminated night—it's clearly a different planet than this one.

"The world exists to serve people, because man is the most honorable of all creatures," says Turkish Sufi master Abdülhamit Çakmut. "There are cycles in life. From the seed comes the tree, from the tree comes the fruit we eat, and we give back as humans. Everything is meant to serve man. If people are gone from this cycle, nature itself will be over."

The Muslim dervish practice he teaches reflects the recognition that everything, from atoms to our galaxy, whirls in cycles, including nature as it continually regenerates—at least until now. Like so many others—Hopis, Hindus, Judeo-Christians, Zoroastrians—he warns of an end-time. (In Judaism, time itself is said to end, but only God knows what that means.) "We see the signs," Çakmut says. "Harmony is broken. The good are outnumbered. There is more injustice, exploitation, corruption, pollution. We are facing it now."

It's a familiar scenario: Good and evil finally spin apart, landing in

heaven and hell, respectively, and everything else vanishes. Except, Abdülhamit Çakmut adds, we can slow this process—the good are those who strive to restore harmony and speed nature's regeneration.

"We take care of our bodies to live a longer life. We should do the same for the world. If we cherish it, make it last as long as possible, we can postpone the judgment day."

Can we? Gaia theorist James Lovelock prophesies that unless things change soon, we'd better stash essential human knowledge at the poles in a medium that doesn't require electricity. Yet Dave Foreman, founder of Earth First!, a cadre of environmental guerrillas who had all but given up on humans deserving a place in the ecosystem, now directs The Rewilding Institute, a think tank based on conservation biology and unapologetic hope.

That hope both includes, and depends on, the consecration of "mega-linkages"—corridors that would span entire continents, where people would be committed to coexisting with wildlife. In North America alone, he sees a minimum of four: they would span the continent's dividing spine, the Atlantic and Pacific coasts, and the Arctic-boreal. In each, top predators and large fauna absent since the Pleistocene would be reinstated, or the closest things possible: African surrogates of America's missing camels, elephants, cheetahs, and lions.

Dangerous? The payoff for humans, Foreman and company believe, is that in a re-equilibrated ecosystem, there's a chance for us to survive. If not, the black hole into which we're shoving the rest of nature will swallow us as well.

It's a plan that keeps Paul Martin, author of the Blitzkrieg extinction theory, in touch with Kenya's David Western, fighting to stop elephants from downing every last drought-stressed fever tree: Send some of those proboscids to America, pleads Martin. Let them again eat Osage oranges, avocados, and other fruit and seeds that evolved to be so big because megafauna could ingest them.

Yet the biggest elephant of all is a figurative one in the planet-sized room that is ever harder to ignore, although we keep trying. Worldwide, every four days human population rises by 1 million. Since we can't really grasp such numbers, they'll wax out of control until they crash, as has happened to every other species that got too big for this box. About the only

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thing that could change that, short of the species-wide sacrifice of voluntary human extinction, is to prove that intelligence really makes us special after all.

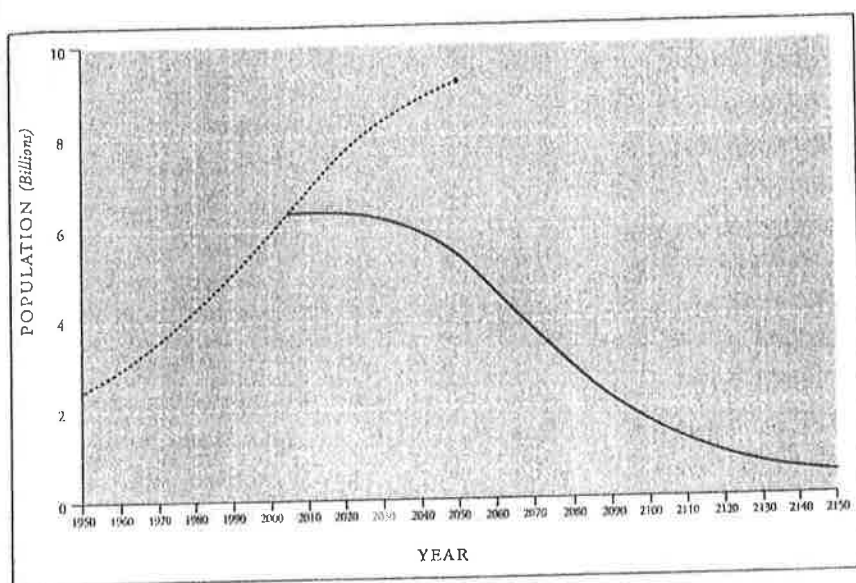
The intelligent solution would require the courage and the wisdom to put our knowledge to the test. It would be poignant and distressing in ways, but not fatal. It would henceforth limit every human female on Earth capable of bearing children to one.

The numbers resulting from such a draconian measure, fairly applied, are tricky to predict with precision: Fewer births, for example, would lower infant mortality, because resources would be devoted to protecting each precious member of the latest generation. Using the United Nations' medium scenario for life expectancy through 2050 as a benchmark, Dr. Sergei Scherbov, who is the research group leader at the Vienna Institute of Demography of the Austrian Academy of Sciences and an analyst for the World Population Program, calculated what would happen to human population if, from now on, all fertile women have only one child (in 2004, the rate was 2.6 births per female; in the medium scenario that would lower to about two children by 2050).

If this somehow began tomorrow, our current 6.5 billion human population would drop by 1 billion by the middle of this century. (If we continue as projected, it will reach 9 billion.) At that point, keeping to one-child-per-human-mother, life on Earth for all species would change dramatically. Because of natural attrition, today's bloated human population bubble would not be reinflated at anything near the former pace. By 2075, we would have reduced our presence by almost by half, down to 3.43 billion, and our impact by much more, because so much of what we do is magnified by chain reactions we set off through the ecosystem.

By 2100, less than a century from now, we would be at 1.6 billion: back to levels last seen in the 19th century, just before quantum advances in energy, medicine, and food production doubled our numbers and then doubled us again. At the time, those discoveries seemed like miracles. Today, like too much of any good thing, we indulge in more only at our peril.

At such far-more-manageable numbers, however, we would have the benefit of all our progress plus the wisdom to keep our presence under control. That wisdom would come partly from losses and extinctions too



Projections, Population of the World:

----- Medium UN scenario: fertility declining from 2.6 children per woman in 2004 to slightly over 2 children per woman in 2050. Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2005).

———— Scenario assuming that all fertile women are henceforth limited to 1 child. Source: Dr. Sergei Scherbov, research group leader, Vienna Institute of Demography, Austrian Academy of Sciences.

CHART BY JONATHAN BENNETT

late to reverse, but also from the growing joy of watching the world daily become more wonderful. The evidence wouldn't hide in statistics. It would be outside every human's window, where refreshed air would fill each season with more birdsong.

If we don't, and thus let our numbers increase by half again as projected, could our technology stretch resources once more, as it did for a while back in the 20th century? We've already heard from the robot contingent. Relaxing on the deck of the *White Holly*, watching the sharks roll by, microbiologist Forest Rohwer takes a stab at another theoretical possibility:

"We could try using lasers, or some similar particle-wave beams, to ac-

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tually build things remotely on other planets, or in other solar systems. That would be much faster than actually sending something there. Maybe we could code for a human, and build a human in space. The life sciences will probably provide the ability to do that. Whether physics will allow it, I don't know. But it's all just biochemistry, so there's no reason why we couldn't construct it.

"Unless," he allows, "there really is something called a spark of life. But it's going to take something like that, because there's no evidence that we could actually move from here in any reasonable time frame."

If we could do that—find a fertile planet somewhere big enough for all of us, holographically clone our bodies, and upload our minds across light-years—eventually the Earth would do fine without us. With no more herbicides, weeds (otherwise known as biodiversity) would invade our industrial farms and our vast monocultured commercial pine plantations—although, in America, for a while the weeds may mostly be kudzu. It's only been around since 1876, when it was brought from Japan to Philadelphia as a centennial gift to the United States, and eventually something is bound to learn to eat it. In the meantime, without gardeners endlessly trying to uproot the ravenous stuff, long before the vacant houses and skyscrapers of America's southern cities tumble, they may have already vanished under a bright, waxy green, photosynthesizing blanket.

Since the late 19th century, when, beginning with electrons, we got down to manipulating the most fundamental particles of the universe, human life has changed very fast. One measure of how fast is that, barely a century ago—until Marconi's wireless and Edison's phonograph—all the music ever heard on Earth was live. Today, a tiny fraction of 1 percent is. The rest is electronically reproduced or broadcast, along with a trillion words and images each day.

Those radio waves don't die—like light, they travel on. The human brain also emanates electric impulses at very low frequencies: similar to, but far weaker than, the radio waves used to communicate with submarines. Paranormalists, however, insist that our minds are transmitters that, with special effort, can focus like lasers to communicate across great distances, and even make things happen.

That may seem far-fetched, but it's also a definition of prayer.

The emanations from our brains, like radio waves, must also keep going—where? Space is now described as an expanding bubble, but that architecture is still a theory. Along its great mysterious interstellar curvatures, perhaps it's not unreasonable to think that our thought waves might eventually find their way back here.

Or even that one day—long after we're gone, unbearably lonely for the beautiful world from which we so foolishly banished ourselves—we, or our memories, might surf home aboard a cosmic electromagnetic wave to haunt our beloved Earth.

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