

The Doomslayer

By Ed Regis

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The environment is going to hell, and human life is doomed to only get worse, right? Wrong. Conventional wisdom, meet Julian Simon, the Doomslayer.

This is the litany : Our resources are running out. The air is bad, the water worse. The planet's species are dying off - more exactly, we're killing them -at the staggering rate of 100,000 per-year, a figure that works out to almost 2,000 species per week, 300 per day, 10 per-hour, another dead species every six minutes. We're trashing the planet, washing away the topsoil, paving over our farmlands, systematically deforesting our wildernesses, decimating the biota, and ultimately killing ourselves.

The world is getting progressively poorer, and it's all because of population, or more precisely, overpopulation. There's a finite store of resources on our pale blue dot, spaceship Earth, our small and fragile tiny planet, and we're fast approaching its ultimate carrying capacity. The limits to growth are finally upon us, and we're living on borrowed time. The laws of population growth are inexorable. Unless we act decisively, the final result is written in stone: mass poverty, famine, starvation, and death.

Time is short, and we have to act now.

That's the standard and canonical litany. It's been drilled into our heads so far and so forcefully that to hear it yet once more is ... well, it's almost reassuring. It's comforting, oddly consoling - at least we're face to face with the enemies: consumption, population, mindless growth. And we know the solution: cut back, contract, make do with less. "Live simply so that others may simply live."

There's just one problem with The Litany, just one slight little wee imperfection: every item in that dim and dreary recitation, each and every last claim, is false. Incorrect. At variance with the truth.

Not the way it is, folks.

Thus saith The Doomslayer, one Julian L. Simon, a neither shy nor retiring nor particularly mild-mannered professor of business administration at a middling eastern-seaboard state university. Simon paints a somewhat different picture of the human condition circa 1997.

"Our species is better off in just about every measurable material way," he says. "Just about every important long-run measure of human material welfare shows improvement over the decades and centuries, in the United States and the rest of the world. Raw materials - all of them - have become less scarce rather than more. The air in the US and in other rich countries is irrefutably safer to breathe. Water [cleanliness has improved. The environment is increasingly healthy, with every prospect that this trend will continue.

"Fear is rampant about rapid rates of species extinction," he continues, "but the fear has little or no basis. The highest rate of observed extinction, though certainly more have gone extinct unobserved, is one species per year ..."

(One species per year!)

"... in contrast to the 40,000 per year that some ecologists have been forecasting for the year 2000.

"The scare that farmlands are blowing and washing away is a fraud upon the public. The aggregate data on the condition of farmland and the rate of erosion do not support the concern about soil erosion. The data suggest that the condition of cropland has been improving rather than worsening."

As for global deforestation, "the world is not being deforested; it is being reforested in general."

Still, there is one resource that the world does not have enough of, that's actually getting rarer, according to Julian Simon. That resource: people.

"People are becoming more scarce," he says, "even though there are more of us."

Hello?

Simon started off as a card-carrying antigrowth, anti-population zealot. He'd been won over by the conventional reasoning; he regarded the central argument as absolutely persuasive. And indeed, if we rehearse it now, it sounds like a faultless proof, clear and compelling, even watertight.

The classical case against population growth was expressed in 1798 by Thomas Malthus, the British economist and country parson who wrote in *An Essay on the Principle of Population*: "Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will show the immensity of the first power in comparison of the second."

As a point of abstract mathematics, there is no way around the conclusion that a geometric progression, if carried on far enough, will eventually overtake an arithmetic progression, no matter what. If population increases geometrically while "subsistence," or food, increases arithmetically, then sooner or later the population will run out of food. End of story.

Or so it would appear, except for the following embarrassing fact: "Population has never increased geometrically," says Simon. "It increases at all kinds of different rates historically, but however fast it increases, food increases at least as fast, if not faster. In other words, whatever the rate of population growth is, the food supply increases at an even faster rate."

These, he says, are the actual and empirical facts of the matter, information available to any inquirer. Simon first got a taste of those facts while studying the data amassed by the economic demographer Simon Kuznets (winner of the 1971 Nobel Prize in economics) and by economist Richard Easterlin, in the mid-1960s. Kuznets had followed population growth trends that went back 100 years and compared them against standard of living, while Easterlin analyzed the same data for selected countries since World War II. The

studies showed that while population growth rates varied from country to country and from year to year, there was no general negative correlation with living standards. People did not become poorer as the population expanded; rather, as their numbers multiplied, they produced what they needed to support themselves, and they prospered.

The trends were the same for food supply. Rising population did not mean less food, just the opposite: instead of skyrocketing as predicted by the Malthusian theory, food prices, relative to wages, had declined historically. In the United States, for example, between 1800 and 1980, the price of wheat plummeted while the population grew from 5 million to 226 million. According to Malthus, all those people should have been long dead, the country reduced to a handful of fur trappers on the brink of starvation. In fact, there was a booming and flourishing populace, one that was better-fed, taller, healthier, more disease-free, with far less infant mortality and longer life expectancy than ever before in human history. Obesity, not starvation, was the major American food problem in 1980. Those were the facts.

Nor should they have come as any great surprise, once you gave the matter some thought. Plants and animals used for food constitute "populations" just as human beings do, and so they, too, ought to increase not arithmetically, as Malthus claimed, but geometrically. The food supply, in other words, ought to keep pace with human population growth, thereby leaving all of us well-fed, happy, and snug in our beds.

Which, Simon discovered, is exactly what has happened throughout history. So if you look at the facts - as opposed to spinning out theories - you find precisely the reverse of the situation described by Malthus. Just the opposite!

Simon acquired his habit of looking up the facts in early childhood, at the dinner table of the family home in Newark, New Jersey. He'd be in some argument with his father over the benefits of exercise, the price of butter, or the health value of air conditioning, and whether from ignorance, pigheadedness, or general perversity, his father would always take some outlandish, off-the-wall viewpoint, such as: "The price of butter is 8 cents a pound."

Julian: "No, it's not, it's 80 cents a pound. It's in the newspaper, take a look."
Father: "I don't have to look. I know it's 8 cents a pound."
Julian: "Do you want to bet? I'll bet you it's not 8 cents a pound."

His father would never take the bet, but Julian would go to the library anyway, look things up in books, and come back with a ream of facts and data. His father, however, couldn't care less.

"I clearly didn't like my father," says Simon.

It's an attitude that drives him crazy to this day - people who know in advance what the truth is, who don't need to avail themselves of any "facts." But Simon loves facts and figures, he loves tables, charts, graphs, information arranged in rows and columns. Tabulations, the slopes of curves, diagrams, pie charts, histograms - he's a regular Mr. Data.

Of course, since people don't particularly like to have their cherished beliefs contradicted by heaps of facts served up on a platter, Simon has never been Mr. Popularity. He got fired from jobs in the navy because he hated the customary ass-kissing, sucking-up, and

yessir requirements. Nor has he ever been much for schmoozing, glad-handing, or the latter-day manners of get-along, go-along.

"Socially I was always a bit marginal," he admits. "Also, there always lurked inside me some irreverence for authority and orthodoxy."

None of this held him back academically. He got a bachelor's in experimental psychology from Harvard, an MBA from the University of Chicago, and, two years later, in 1961, a PhD in business economics from the same school.

He was not one of those MBAs whose closest contact with the gritty business world was going down to the corner newsstand to purchase a copy of The Wall Street Journal. The year he got his doctorate he started and operated his own business, a mail-order firm that sold quality teas, coffees, and a book on how to make beer at home. The enterprise was successful enough, but not so much as the book he later wrote about it, *How to Start and Operate a Mail-Order Business* (McGraw-Hill, 1965), still in print and currently in its fifth edition.

He got married and had three kids and wound up, successively, as professor of advertising, of marketing, and of business administration and economics at the University of Illinois at Urbana-Champaign. Then in 1966 or so, he had his big idea about how to solve the airline overbooking problem. Anticipating no-shows, airlines routinely oversold their flights. But when more people showed up at the gate than the plane had seats, pandemonium ensued. Well, why not pay people to get off the plane? he wondered. Offer them enough to make it attractive. It would be a voluntary system, and everyone would win.

So in his practical, down-to-earth, this-is-only-reasonable fashion, he submitted his suggestion to the airlines. The idea was laughed at, mocked, and ridiculed as unrealistic and unworkable. An official at Pan American replied: "Of course, we instituted the procedure immediately, after having the instructions translated into 18 languages." Ha ha ha, thank you, and goodbye.

Eleven years later, in 1977, Simon hadn't given up on the scheme. He published it in The Wall Street Journal, in an op-ed piece titled "Wherein the Author Offers a Modest Proposal." And lo and behold, a year after that, when economist Alfred Kahn headed up the Civil Aeronautics Board, Simon's proposal was put into practice. It was a raging success from the start, remains so to this day, and anyone who's ever voluntarily offloaded themselves from a plane for cash or free miles owes a nod of thanks to Julian Simon.

Still, that was a mere flash in the pan, and Simon's overall impact on the world at large was rather less massive than he desired. He was not making a name for himself, not setting the world on fire.

But there were those who were - Paul Ehrlich, for example.

Ehrlich, a Stanford University entomologist who as a youth had seen his best butterfly hunting grounds churned under the real estate developer's plow, wrote the runaway best-seller *The Population Bomb*. Published in 1968, the book was solidly Malthusian.

"The battle to feed all of humanity is over," it began. "In the 1970s and 1980s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate,

although many lives could be saved through dramatic programs to 'stretch' the carrying capacity of the earth by increasing food production and providing for more equitable distribution of whatever food is available. But these programs will only provide a stay of execution unless they are accompanied by determined and successful efforts at population control." And so on, The Complete and Authoritative Litany, for the next 200 pages.

This late-breaking Malthusian out-burst, strangely enough, did set the world on fire. The book sold 3 million copies, became the best-selling environmental tract of all time, and got the author on The Tonight Show.

At home in Illinois, Simon watched Ehrlich on the Johnny Carson show, and he went bananas. In fact, more bananas than he'd ever before gone in his life. Simon had by that time decided that the Malthusian stuff was the purest mythology, an invention out of whole cloth, a theory that was entirely controverted by every available empirical fact. And here was Paul Ehrlich on TV spreading his stardust all over the place and holding Johnny Carson in some kind of mystic thrall.

"It absolutely drove me out of my skull," he recalls. "Here was a guy reaching a vast audience, leading this juggernaut of environmentalist hysteria, and I felt utterly helpless. What could I do? Go talk to five people?"

As bad an experience as that was, matters immediately got worse. The next year, 1969, Ehrlich published an article called "Eco-Catastrophe!" in Ramparts. "Most of the people who are going to die in the greatest cataclysm in the history of man have already been born," it said. "By that time [1975] some experts feel that food shortages will have escalated the present level of world hunger and starvation into famines of unbelievable proportions."

When, in 1974, Ehrlich and his wife, Anne Ehrlich, also a Stanford biologist, published a new book, The End of Affluence, in which they warned of a "nutritional disaster that seems likely to overtake humanity in the 1970s (or, at the latest, the 1980s). Due to a combination of ignorance, greed, and callousness, a situation has been created that could lead to a billion or more people starving to death.... Before 1985 mankind will enter a genuine age of scarcity" in which "the accessible supplies of many key minerals will be nearing depletion."

Julian Simon read this stuff, which he viewed as unalloyed and total nonsense. He brooded and fumed and stewed in his juices. He experienced what might be called a personal lull.

And then, finally, in 1980 he emerged from the cocoon. He'd gone into it as a humble professor of marketing and a passive spectator of global death sentence forecasts. But now, suddenly, he broke out into the light of day, he sprang forth onto the world stage, he started swinging his diamond-tipped sword - thwick-thwack! - as ... The Doomslayer!

The rebirth occurred in the pages of Science, in an article titled "Resources, Population, Environment: An Oversupply of False Bad News." It led with a summary that became a manifesto: False bad news about population growth, natural resources, and the environment is published widely in the face of contrary evidence. For example, the world supply of arable land has actually been increasing, the scarcity of natural resources including food and energy has been decreasing, and basic measures of U.S. environmental quality show positive trends. The aggregate data show no long-run negative effect of population growth upon standard of living. Models that embody forces

omitted in the past, especially the influence of population size upon productivity increase, suggest a long-run positive effect of additional people.

Written in the form of Statement followed by Fact, every reigning doomsday dragon was neatly slashed in half, the severed beasts left flapping around on the ground like fish.

Statement: The food situation in less-developed countries is worsening.

Fact: Per capita food production has been increasing at roughly 1 percent yearly - 25 percent during the last quarter century.

Statement: Urban sprawl is paving over the United States, including much "prime agricultural land" and recreational areas.

Fact: All the land used for urban areas plus roadways totals less than 3 percent of the United States.... Each year 1.25 million acres are converted to efficient cropland by draining swamps and irrigating deserts.... A million acres yearly goes into additional wilderness recreation areas and wildlife refuges, and another 300,000 acres goes for reservoirs and flood control.

So on and so forth, fact piled upon fact, paragraph after paragraph, all of it buttressed by tables, charts, graphs, and diagrams, plus 42 footnotes, many of them containing additional data.

Letters to the editor poured into Science in an unseemly rush. A few of them expressed partial agreement, but the majority were heavily critical. Many of them repeated statutory items of The Litany - "human beings, like any other species, have the biological capacity to overrun the carrying capacity of their habitat" - and there were even some feeble attempts at humor: in extrapolating from past trends, said one writer, Simon is like "the person who leaped from a very tall building and on being asked how things were going as he passed the 20th floor replied, 'Fine, so far.'" (Simon's response: "I think the better story is about somebody who has a rope lifeline and falls off the 15th floor. Somewhere about 30 feet above the ground, she lets go of the rope. You ask her, 'Why did you let go of the rope?' And she answers, 'It was going to break anyway.' That's how many activists would like us to behave.")

Anne and Paul Ehrlich, along with two energy and natural resource experts, John Holdren and John Harte, wrote their own letter to the editor. After charging Simon with various "errors about the economics of scarcity," they went on to make some new doomsday predictions: "If deforestation for agriculture proceeds on a large enough scale, the resulting pulse of carbon dioxide may combine with that from increasing fossil-fuel combustion to alter global climate in a way that undermines food production to an unprecedented degree." They also corrected one of Simon's data points having to do with electricity, which Simon claimed had gotten cheaper. "The fact is," they said, "that real electricity prices bottomed in 1971 and were already up 18 percent from that low point in 1972." An 18 percent increase where Simon said there'd been a decline!

"I was taken aback," said Simon in his published reply. "Holdren and Harte are energy scholars. I checked Fig. 1 and other sources but could see no sign of their 18 percent." So he placed a phone call to the coauthor of the report cited by Holdren, Harte, and the Ehrlichs. "He, too, was puzzled. Upon investigation, the 1971 number (80.2) proved to be a typographical error and should have been 93.3. So much for Holdren et alia's 'fact.'"

The battle lines now drawn, it was not long before Ehrlich and Simon met for a duel in the sun. The face-off occurred in the pages of *Social Science Quarterly*, where Simon challenged Ehrlich to put his money where his mouth was. In response to Ehrlich's published claim that "If I were a gambler, I would take even money that England will not exist in the year 2000" - a proposition Simon regarded as too silly to bother with - Simon countered with "a public offer to stake US\$10,000 ... on my belief that the cost of non-government-controlled raw materials (including grain and oil) will not rise in the long run."

You could name your own terms: select any raw material you wanted - copper, tin, whatever - and select any date in the future, "any date more than a year away," and Simon would bet that the commodity's price on that date would be lower than what it was at the time of the wager.

"How about it, doomsayers and catastrophists? First come, first served."

In California, Paul Ehrlich stepped right up - and why not? He'd been repeating the Malthusian argument for years; he was sure that things were running out, that resources were getting scarcer - "nearing depletion," as he'd said - and therefore would have to become more expensive. A public wager would be the chance to demonstrate the shrewdness of his forecasts, draw attention to the catastrophic state of the world situation, and, not least, force this Julian Simon character to eat his words. So he jumped at the chance: "I and my colleagues, John P. Holdren (University of California, Berkeley) and John Harte (Lawrence Berkeley Laboratory), jointly accept Simon's astonishing offer before other greedy people jump in."

Ehrlich and his colleagues picked five metals that they thought would undergo big price rises: chromium, copper, nickel, tin, and tungsten. Then, on paper, they bought \$200 worth of each, for a total bet of \$1,000, using the prices on September 29, 1980, as an index. They designated September 29, 1990, 10 years hence, as the payoff date. If the inflation-adjusted prices of the various metals rose in the interim, Simon would pay Ehrlich the combined difference; if the prices fell, Ehrlich et alia would pay Simon.

Then they sat back and waited.

Between 1980 and 1990, the world's population grew by more than 800 million, the largest increase in one decade in all of history. But by September 1990, without a single exception, the price of each of Ehrlich's selected metals had fallen, and in some cases had dropped through the floor. Chrome, which had sold for \$3.90 a pound in 1980, was down to \$3.70 in 1990. Tin, which was \$8.72 a pound in 1980, was down to \$3.88 a decade later.

Which is how it came to pass that in October 1990, Paul Ehrlich mailed Julian Simon a check for \$576.07.

A more perfect resolution of the Ehrlich-Simon debate could not be imagined. All of the former's grim predictions had been decisively overturned by events. Ehrlich was wrong about higher natural resource prices, about "famines of unbelievable proportions" occurring by 1975, about "hundreds of millions of people starving to death" in the 1970s and '80s, about the world "entering a genuine age of scarcity."

In 1990, for his having promoted "greater public understanding of environmental problems," Ehrlich received a MacArthur Foundation "genius" award.

By the time he'd won the bet, Simon and his family had moved back to the East Coast, he to take up a position as professor of business administration at the University of Maryland, and his wife, Rita Simon, a sociologist, to become professor of criminal justice at the American University in Washington, DC. They moved into a red brick house in Chevy Chase, Maryland, an upper-middle-class community inside the Beltway.

The house had computers on every floor, two Xerox copiers, and an assortment of exercise machines on which Julian Simon read books or newspapers while trying to keep his spare and straight body in fighting trim. When it wasn't raining, snowing, or more than 100 degrees outside, he did his research and writing out on the deck, sometimes with a wet sponge covering his shaved bald head. He'd sit there in the shade of the mulberry tree, binoculars nearby to stare at birds - particularly hummingbirds that came to a feeder. And with battery-acid coffee from a thermos that looked as if it came over on the Mayflower, he'd tilt at new windmills.

He always found it somewhat peculiar that neither the Science piece nor his public wager with Ehrlich nor anything else that he did, said, or wrote seemed to make much of a dent on the world at large. For some reason he could never comprehend, people were inclined to believe the very worst about anything and everything; they were immune to contrary evidence just as if they'd been medically vaccinated against the force of fact. Furthermore, there seemed to be a bizarre reverse-Cassandra effect operating in the universe: whereas the mythical Cassandra spoke the awful truth and was not believed, these days "experts" spoke awful falsehoods, and they were believed. Repeatedly being wrong actually seemed to be an advantage, conferring some sort of puzzling magic glow upon the speaker.

There was Lester Brown, for example, founder and president of the Worldwatch Institute, who in 1981 wrote: "The period of global food security is over. As the demand for food continues to press against the supply, inevitably real food prices will rise. The question no longer seems to be whether they will rise but how much."

All during the 1980s, however, wheat and rice prices declined; in mid-century, in fact, they reached all-time lows. But this made no difference, and in 1986, for his work on the "global economy and the natural resources and the systems that support it," Lester Brown, too, received a MacArthur Foundation "genius" award. Julian Simon never received a MacArthur award. "MacArthur!" he says. "I can't even get a McDonald's!" This did not discourage him. Doomsaying was a thankless task, but it had to be done, like taking out the garbage: it had to be carted to the dump today even if there'd be another big pile of it tomorrow.

So Simon penned tract after tract pleading his case: *The Ultimate Resource* (Princeton University Press, 1981), arguing that the most valuable resource of all was people; *Theory of Population and Economic Growth* in 1986; *Population and Development in Poor Countries* in 1992, and so on. In all, he wrote or edited a rough dozen such books, all of them aimed at demolishing one or another tenet of The Litany. But the nearest he got to that MacArthur was a senior fellowship from the conservative Cato Institute.

Naturally, he received a fair amount of bad press for all this heresy, particularly for his pet claim that what the world needs most is lots of additional human beings. They're not just mouths to feed, he argued. Newborn babes grow up to be creative adults; they turn into individuals who contribute and achieve, who give back far more than they ever take.

But nobody could believe it.

"He's overly optimistic," said Peggy Rizo, then of the Washington, DC-based Population Crisis Committee, now called Population Action International. "He is an economist who is trying to transpose what he believes to be the American prairie experience into the experience of crowded areas like Africa, Central America, and Asia."

"What does it mean in terms of the quality of life of the people of the 21st century when cities are joined to cities and we have just several huge megalopolises?" asked Rupert Cutler, then executive director of the Environmental Fund, which became Population Environment Balance, headquartered in Washington, DC. "I think we can predict a pall of brown air over these cities. We can predict water shortages, joblessness ... and crime."

Well, it wasn't as if Julian Simon hadn't heard that before.

Finally, in 1995 he came out with his crowning fact-feast and catalog of bounty, a book he edited called *The State of Humanity*. Almost 700 pages of dense text plus charts and figures, the quantity of factual information in it was nothing short of amazing. Simon had data you didn't even know people track, such as:

World cereal yields, 1950-1990.

Declining crowding in American housing, persons per room, 1900-1987.

Northeast Brazil: apparent per capita daily consumption of major starchy staples among low-income classes, 1974-1975.

Industrial lead pollution at Camp Century, Greenland, since 800 BC.

Oxygen content (in milliliters per liter) at 100 meters depth at Station F 12 in the Bothnian Bay of the Baltic Sea 1900-1968.

Arcane as some of it was, Simon was extremely adept at using this material in formal debates. In July 1996, at a public event sponsored by the World Future Society, Simon debated Hazel Henderson, a private researcher and author of *Building a Win-Win World* (see "Win-Win World," page 152). Henderson, who was trying to make a case that government regulation was responsible for reduced air pollution, came armed with a graph showing a decline in pollution levels in London since the late 1950s. The slope of the line was clearly downward, illustrating, she said, the effect of London's Clean Air Act of 1956.

In his rebuttal period, Simon presented a graph of his own. Whenever he presents any data, his practice is to present the figures going all the way back to day one, to the start of record-keeping on the parameter in question. You have to focus on aggregate trends over the long term, he insists, not just pick and choose some little fleeting data chunks that seem to support your case. So his own chart of smoke levels in London stretched back into the 1800s, and the line from the 1920s on showed a constant and uniform downward slope. "If you look at all the data," he said, "you can't tell that there was a clean-air act at any point."

Anyone who wonders about the accuracy of Simon's data or conjures up rafts of competing data on the other side of the issue will be met with Simon's claim that: "There are no other data." His statistics, he claims, come from the "official" sources, the standard reference works that everyone uses.

"Test for yourself the assertion that the physical conditions of humanity have gotten better. Pick up the US Census Bureau's Statistical Abstract of the United States and Historical Statistics of the United States at the nearest library. They're accessible to any schoolkid. Start at 1800. Those books have half the data you need for almost anything."

Well, if you've never opened a volume of Historical Statistics of the United States, you don't know what excitement is. Two fat square tomes chock-full of charts, tables, and black ink.

"Wonderful, wonderful books!"

For each of Simon's claims that I checked, the data in those volumes were identical to his. Black infant mortality rates are declining, he says in *The State of Humanity*. And on page 57 of volume one of *Historical Statistics of the United States*, in Table B 136-147, under "Fetal Death Ratio; neonatal, infant, and maternal mortality rates, by race: 1915 to 1970," the precise same decline in mortality rates is presented in tabular form: from 180 black infant deaths per 1,000 live births in 1915 to 31 per 1,000 in 1970. Similarly, his figures for life expectancy correspond to those in the original sources. Same for air pollution.

So go ahead and check his data! Enjoy!

Some of Simon's other claims, however, are so far from received opinion as to be hard to take seriously - his view on species loss, for example, regarding which he asserts that "the highest rate of observed extinctions is one species per year."

That was hard to accept. Harvard biologist Edward O. Wilson, the guru of global species extinction, said in 1991: "Believe me, species become extinct. We're easily eliminating 100,000 a year." A year later, in his 1992 book *The Diversity of Life*, he had modified that figure somewhat, saying: "The number of species doomed each year is 27,000." Apparently, these numbers were a tiny bit slippery. Still, both of them were a far cry from Simon's "one species per year."

Simon, on the other hand, pointed out that the higher estimates did not come from observation, they came from theory, specifically from Wilson's own theory of "island biogeography" which correlates species extinction with tropical forest destruction. The theory's "species-area equation," supposedly, predicts that for each additional unit of forest destroyed, so many more species die out.

This was another mathematical argument, reminiscent of the one made long ago by Malthus, and it was exactly the type of Neat Mathematical Certainty that Julian Simon took so much joy in shooting big holes through, which is what he proceeded to do now. The problem with the theory, he wrote in a paper on species loss with Aaron Wildavsky, is that it is not borne out by the empirical facts.

"The only empirical observation we found is by Lugo for Puerto Rico, where 'human activity reduced the area of primary forests by 99 percent.... This massive forest conversion did not lead to a correspondingly massive species extinction.'" Simon quoted Lugo to the effect that "more land birds have been present on the Island in the 1980s (97 species) than were present in pre-Columbian times (60 species)."

Say again? The forest was 99 percent demolished, and the number of bird species actually rose?

Even for me, this was too much.

The International Institute of Tropical Forestry, part of the US Forest Service, is located in an overgrown gray stone building in San Juan's Botanical Gardens. Ariel E. Lugo, a slim, gray-bearded man in a silver-green forest service uniform, is director.

He's also a world-class expert on tropical forests and species extinction. A native of Puerto Rico, Lugo was educated in San Juan through his master's degree, came to the mainland, got a PhD in plant ecology from the University of North Carolina at Chapel Hill, then taught botany for 10 years at the University of Florida. He spent two years at the Puerto Rico Department of Natural Resources and two more years on Jimmy Carter's Council on Environmental Quality in Washington, DC. Finally, he went back to San Juan as director of the Institute, a position he's held for the last 17 years.

"I see myself as in the middle of the road," he says. "On the right of me is Julian Simon, who sees nothing wrong. You know, 'We're doing just fine.' I don't want you to put me at that extreme."

Still, Lugo is not what could be called a major supporter of Wilson's theory of island biogeography, or of the species-area equation that forms its mathematical centerpiece. The equation is simple enough: $S = CA^z$ where S is the number of species, A is the area, and C and z are constants for the type of species in question, its location, and other factors. The apparent certainty it embodies, however, is an illusion, according to Lugo.

"The first uncertainty is that we don't know how many species there are. The margin of error is enormous: depending on who you talk to there is anywhere between 5 million and 100 million species, but science has described only a million species. How can you predict how many species are lost if you don't know how many species you're dealing with?"

The second problem is that the equation was never intended to describe extinctions to begin with. "It was a device for explaining the number of species on islands," he says. Generally, the bigger the island, the more species it has, other things being equal. But even if cutting down an island's forests causes species to leave the area, that's not the same thing as making those species extinct. "The presence or absence of a species in a particular area is one thing, whereas wiping out the genome of that species is another thing altogether - wiping out the seed, wiping out the mechanisms for hibernation, wiping out its dispersal, wiping out the management of the species. That's a completely different biology.

"And what is the relationship between deforestation and species loss to begin with?" he asks. "Do we understand that? Do we know that when you deforest an acre, you lose x proportion of species, to extinction? Well, I'm afraid that nobody knows that. There is not one study that can claim to have understood the relationship between deforestation and species lost to extinction.

"And so if you're an objective scientist," he says, "you cannot put a number to the rate of species lost. But I believe we're exaggerating the numbers.

"What's unstated in all this is that when you deforest, you go to zero, that you go to pavement. That's how I put it, that 'you go to pavement.' This is why people get mad at me, because at this point in my talks I show a slide of pavement, but the pavement has weeds growing through it. I can take you to places of abandoned roads in the rain forest that have trees growing out of them."

Trees sprouting from the asphalt! Birds perching on the branches, insects crawling, worms boring, bees buzzing, lizards walking, moss growing on the tree trunk!

"Look at the example of Puerto Rico," Lugo says. "This island has a documented deforestation rate of 90 percent, and it has a documented loss of primary forest of 97 to 98 percent. So here's an island that has lost in the past, in the recent past, up to the '50s - I was already born when the island was at the peak of deforestation - it's lost almost all of its forest.

"The first surprise is that there are more bird species here now than ever, in part due to the invasion of nonindigenous species. The second surprise is that much of the forest has grown back."

On Lugo's conference table is a book open to two photographs.

"Now, where I'm gonna send you today," he says, "is here."

He points to a road that winds through the western fringe of El Yunque, the Caribbean National Forest, the only tropical rain forest in the US national forest system. Picture One, an aerial photograph taken in 1951, shows the area on the west side of the road: clear-cut, mowed down, absolutely denuded of trees. It looks like stumps and dead grass. The east side of the road, by contrast, is deep, dark, and flush with vegetation, an untouched virgin rain forest.

Picture Two shows the same area 13 years later: from the aerial photograph, both sides of the road are identical.

"You can see that it recovered," says Lugo. "So, you take your car and you ride through these forests, and you tell me."

Puerto Rico Route 186 is not far away, about 30 minutes by traffic jam. The road is paved but unmarked, slightly more than a lane wide, just enough space for two cars to pass without the sound of impact. You drive toward the mountains, white clouds bunched above, isolated raindrops spattering the windshield, and in five or six minutes there's tropical forest on both sides. Tall ferns, flame trees, mahogany trees, humongous green leafy plants, plus massive clumps of bamboo - stalks that tower 20 or 30 feet overhead.

Julian Simon: The facts are fundamental.

Garrett Hardin: The facts are not fundamental. The theory is fundamental. - from a 1982 debate with the UC Santa Barbara biologist

The doomsayer-debater debate, Simon thinks, is an opposition between fact and bad theory, a case of empirical reality versus abstract principles that purport to define the way things work but don't.

"It's the difference," he says, "between a speculative analysis of what must happen versus my empirical analysis of what has happened over the long sweep of history."

The paradox is that those abstract principles and speculative analyses seem so very logical and believable, whereas the facts themselves, the story of what has happened, appear wholly illogical and impossible to explain. After all, people are fruitful and they multiply but the stores of raw materials in the earth's crust certainly don't, so how can it

be possible that, as the world's population doubles, the price of raw materials is cut in half?

It makes no sense. Yet it has happened. So there must be an explanation.

And there is: resources, for the most part, don't grow on trees. People produce them, they create them, whether it be food, factories, machines, new technologies, or stockpiles of mined, refined, and purified raw materials.

"Resources come out of people's minds more than out of the ground or air," says Simon. "Minds matter economically as much as or more than hands or mouths. Human beings create more than they use, on average. It had to be so, or we would be an extinct species."

The defect of the Malthusian models, superficially plausible but invariably wrong, is that they leave the human mind out of the equation. "These models simply do not comprehend key elements of people - the imaginative and creative."

As for the future, "This is my long-run forecast in brief," says Simon. "The material conditions of life will continue to get better for most people, in most countries, most of the time, indefinitely. Within a century or two, all nations and most of humanity will be at or above today's Western living standards.

"I also speculate, however, that many people will continue to think and say that the conditions of life are getting worse."

But you don't have to be one of those people, one of those forever Glum and Gloomy Gusses. All you've got to do is keep your mind on the facts.

The world is not coming to an end.
Things are not running out.
Time is not short.
So, smile!
Shout!
Enjoy the afternoon!