JARED DIAMOND

Twilight at Easter

FROM *The New York Review of Books*

1

NO OTHER SITE that I have visited made such a ghostly impression on me as did Rano Raraku, the quarry on Easter Island where its famous gigantic stone statues were carved. To begin with, the island is the world's most remote habitable scrap of land, lying far out in the southeastern Pacific Ocean, 2,300 miles west of the coast of Chile and 1,300 miles east of Pitcairn Island. Rano Raraku itself is a volcanic crater 600 yards in diameter, which I entered by a trail rising steeply up to the crater rim from the plain outside, and then dropping steeply down again toward the marshy lake on the crater floor. No one lives in the vicinity today.

Scattered over the crater's walls are 397 stone statues, each representing in a stylized way a long-eared legless human male torso, most of them 15 to 20 feet tall, the largest of them 70 feet tall (taller than the average modern five-story building), and weighing from 10 to 270 tons. The remains of a transport road can be discerned passing out of the crater through a notch cut into a low point in its rim, from which three more roads radiate north, south, and west for up to nine miles toward Easter's coasts.

Scattered along the roads are 97 more statues, as if abandoned in transport from the quarry. Along the coast are 113 stone platforms that formerly supported or were associated with 393 more statues, all of which (until the recent re-erection of a few) were no longer standing but had been thrown down, many of them toppled and deliberately broken at the neck. Yet Easter Island's Polynesian pop-

ulation had possessed no cranes, wheels, machines, metal tools, draft animals, or means other than human muscle power to move the statues.

Statues remaining at the quarry are in all stages of completion. Some are still attached to the bedrock out of which they were carved, roughed out but with details of the ears or hands missing. Others are finished, detached, and lying on the crater slopes below, and still others had been erected in the crater. Littering the ground everywhere at the quarry are the stone picks, drills, and hammers with which the statues were being carved. The scene gave me the sense of a factory all of whose workers had suddenly quit for mysterious reasons, thrown down their tools, and stomped out, leaving each statue in whatever stage it happened to be at the moment. Who carved the statues, how did the carvers move such huge stone masses, and why did they eventually throw them all down?

Easter's mysteries were already apparent to its European discoverer, the Dutch explorer Jacob Roggeveen, who spotted the island on Easter Day (April 5, 1722), hence the name that he bestowed and that has stuck. Like all subsequent visitors, Roggeveen was puzzled, not understanding how the islanders had transported and erected their statues. No matter what had been their exact method, they would have needed heavy timber and strong ropes made from big trees, as Roggeveen realized. Yet the Easter Island that he viewed was a wasteland with not a single tree or bush over ten feet tall. What had happened to all the trees that must have stood there?

All those mysteries have spawned volumes of speculation for almost three centuries. Many Europeans were incredulous that Polynesians, "mere savages," could have constructed the statues or the beautiful stone platforms. The Norwegian explorer Thor Heyerdahl's famous *Kon-Tiki* expedition and his other raft voyages aimed to prove the feasibility of transoceanic connections among Egypt's pyramids, the giant stone architecture of South America's Inca Empire, and Easter Island's statues. Going further, the Swiss writer Erich von Däniken claimed that the statues were the work of intelligent extraterrestrials who had ultramodern tools, became stranded on Easter, and were finally rescued. But the explanation that has now emerged attributes statue carving to the picks and

other tools littering Rano Raraku rather than to hypothetical space implements, and to Easter's known Polynesian inhabitants rather than to Incas, Egyptians, or Martians. This story is as romantic and exciting as were postulated visits by *Kon-Tiki* rafts or extraterrestrials — and much more relevant to events now going on in the modern world.

Easter's history has recently been recounted in two excellent but very different books, both by the authors of the two previous standard books about the island. The geographer and botanist John Flenley, who uncovered the evidence for Easter Island's vanished forest and extinct giant palm trees, has collaborated with the well-known archaeologist Paul Bahn to bring the Easter Island story up to date with the discoveries of the last decade. They thereby offer us clear summaries of Easter's settlement and subsequent history, its statues, the frightening collapse of its society, and its broader significance in our world beset with similar environmental problems.

The archaeologist Jo Anne Van Tilburg, the leading authority on the statues themselves, has used her understanding of Easter Island history and statues in her biography of the remarkable self-trained archaeologist and ethnographer Katherine Routledge, who spent seventeen months on the island in 1914–1915, and whose unpublished handwritten field notes Van Tilburg deciphered. The information in those notes is of lasting value because Routledge was an excellent interviewer, and some of her older informants had participated in the island's last traditional ceremonies (the so-called Orongo birdman rites). Those informants told Routledge masses of information about traditional Easter Island society that would otherwise be lost to us.

Van Tilburg has really given us three books in one: a history of a unique society, a Gothic novel, and a powerfully moving biography. The variously furious, passive-aggressive, inept, and effective relations of Routledge and her husband with each other, with other expedition members, with islanders, and with the island priestess Angata, who gained spiritual power over Routledge — all that makes a fascinating story. Routledge wrote of herself in 1891, "It was my misfortune to be born a woman with the feelings of a man." Her tragic biography traces how a rich heiress with a family history

of mental illness mastered her inner problems sufficiently to become one of the earliest women graduates of Oxford University, then to make her own way through a man's world, and to contribute to our understanding of Easter Island, only to succumb at last to paranoia and to die in the mental asylum to which her husband and brother finally committed her.

2

From Flenley and Bahn's and Van Tilburg's accounts, it becomes clear how both Heyerdahl and von Däniken brushed aside overwhelming evidence that the Easter Islanders were indeed typical Polynesians, speaking a Polynesian language and making stone tools in the usual Polynesian styles. Around AD 900 they colonized Easter Island from Polynesian islands to the west and built up a population that peaked at around 15,000 people. At the time of the European arrival they were subsisting mainly as farmers, growing yams, taro, bananas, sugar cane, and sweet potatoes, as well as raising chickens, their sole domestic animal. While Easter Island was divided into about eleven territories, each belonging to one clan under its own chief and competing with other clans, the island was also loosely integrated religiously, economically, and politically under the leadership of one paramount chief. On other Polynesian islands, competition between chiefs for prestige could take the form of inter-island efforts such as trading and raiding, but Easter's extreme isolation from other islands precluded that possibility. Instead, the excellent quality of Rano Raraku volcanic stone for carving eventually resulted in chiefs competing by erecting statues representing their high-ranking ancestors on rectangular stone platforms (termed *ahu*).

Each of the island's eleven territories contained between one and five large *ahu* up to 13 feet high, many extended by lateral wings to a width of up to 500 feet. Today the *ahu* are a dingy dark gray, but originally they must have been a colorful white, yellow, and red: the facing slabs were encrusted with white coral, the stone of a freshly cut statue was yellow, and the statue's crown and a horizontal band of stone coursing on the front wall of some *ahu* were red.

The *ahu*-building period seems to have begun around AD 1000

or 1100, within a few centuries of the island's settlement. An increase in statue size with time suggests competition between rival chiefs commissioning statues to outdo each other. (In case that strikes you as weird, try imagining what a dispassionate observer would say about the increasingly lavish cars, mansions, and jewelry by which modern American "chiefs" compete.) The strong possibility of such competition also seems evident from an apparently late feature called a *pukao:* a cylinder of red volcanic stone, weighing up to twelve tons, mounted as a separate piece to rest on top of a statue's flat head, and possibly representing a chief's headdress or hat of red feathers. All *pukao* are from a single quarry, Puna Pao, where (just as with the statues themselves in Rano Raraku quarry) I saw unfinished *pukao,* plus finished ones awaiting transport. We know of only about sixty *pukao,* reserved for statues on the biggest and richest *ahu.* I cannot resist the thought that they were produced as a show of one-upmanship. They seem to proclaim: "All right, so you can erect a statue 32 feet high, but look at me: I can lift this 12-ton pukao on top of my statue; you try to top that, you wimp!"

How did the islanders succeed in erecting and transporting those statues? Of course we don't know for sure, because no European ever saw it being done to write about it. But we can make informed guesses from the oral traditions of the islanders themselves and from recent experimental tests of different transport methods described by Flenley and Bahn and carried out and described by Van Tilburg.

The still-visible transport roads on which statues were moved from Rano Raraku quarry follow contour lines to avoid the extra work of carrying statues up and down hills and are up to nine miles long for the *ahu* farthest from the quarry. While the task may strike us as daunting, we know that many other prehistoric peoples transported very heavy stones at Stonehenge, Egypt's pyramids, and Inca and Olmec centers, and something can be deduced of the methods in each case. The method most convincing to me is Van Tilburg's suggestion that Easter Islanders modified the so-called canoe ladders widespread on Pacific islands for transporting heavy wooden logs, which had to be cut in the forest, shaped into canoes, and then transported to the coast.

The "ladders," which I have seen on islands near New Guinea, consist of a pair of parallel wooden rails joined by fixed wooden crosspieces over which the log is dragged. We know that some of the biggest canoes that the Hawaiians moved over such horizontal ladders weighed more than an average-sized Easter Island statue, so the proposed method is plausible. Van Tilburg persuaded modern Easter Islanders to put her theory to a test by building such a canoe ladder, mounting a statue prone on a wooden sled, attaching ropes to the sled, and hauling it over the ladder. She found that between fifty and seventy people, working five hours per day and dragging the sled five yards at each pull, could transport an average-sized twelve-ton statue nine miles in a week. By extrapolation, transport of even the biggest statues could have been accomplished by a team of five hundred adults, which would have been just within the manpower capacities of an Easter Island clan.

Islanders told Thor Heyerdahl how their ancestors had erected statues on an *ahu;* they were indignant that archaeologists had never deigned to ask them, and to prove their point they erected a statue for him without a crane. They began by building a gently sloping ramp of stones up to the top of the platform and pulling the prone statue with its base end forward up the ramp. Once the base had reached the platform, they levered the statue's head an inch or two upward with logs, slipped stones under the head to support it in the new position, and continued to lever up the head and thereby tilt the statue increasingly toward the vertical.

However, we have glossed over a problem. Transporting and erecting statues required lots of thick long ropes (made in Polynesia from fibrous tree bark) to drag the sleds and heavy statues, and also many big strong trees to obtain all the timber needed for the sleds, canoe ladders, and levers. But the Easter Island seen by Roggeveen and subsequent European visitors had very few trees, all of them slight and short: it is the most nearly treeless island in Polynesia. Where were the trees that provided the required rope and timber?

3

Botanical surveys of plants living on Easter Island within the twentieth century have identified only forty-eight native species, even the biggest of them hardly worthy of being called a tree (just seven feet

tall), and the rest of them low ferns, grasses, sedges, and shrubs. However, beginning especially with John Flenley's and Sarah King's studies in 1984, several methods for recovering and identifying pollen and wood charcoal from vanished plants have shown that, long before human arrival and still during the early days of human settlement, Easter was not a barren wasteland but supported a subtropical tall forest.

As Flenley and his colleagues recognized, the most interesting of those extinct trees was what used to be the world's largest palm tree, related to but dwarfing the largest existing palm, the Chilean wine palm, which grows up to 65 feet tall and 3 feet in diameter. Chileans prize their palm today for several reasons, and Easter Islanders would have done so as well. As the name implies, the trunk yields a sweet sap that can be fermented to make wine or boiled down to make honey or sugar. The nuts' oily kernels are a delicacy. The fronds are ideal for fabricating into house thatching, baskets, mats, and boat sails. And of course the stout trunks would have served to transport and erect statues and to make rafts.

Many of the twenty-one other vanished plant species besides the palm would also have been valuable to the Easter Islanders. Two of them are tall trees used elsewhere in Polynesia for making canoes. The bark of one of them is used by Polynesians to make rope, and that was presumably how Easter Islanders dragged their statues. Still others variously yielded bark cloth, edible fruits, firewood, or hard wood good for carving, construction, and making harpoons.

Studies of vertebrate bones from middens — mounds of shells, bones, and other refuse — at the probable site of the first human settlement prove that Easter, which today supports not a single species of native land bird, was formerly home to at least six of them, including one species of heron, two chickenlike rails, two parrots, and a barn owl. More impressive was Easter's prodigious total of at least twenty-five nesting sea bird species, making it formerly the richest breeding site in Polynesia and probably in the whole Pacific. They must have been attracted by Easter's remote location and lack of predators, which made it a safe haven as a breeding site — until humans arrived.

The excavations that yielded those bones tell us much about the diet and lifestyle of Easter's early human settlers. The most frequent bones, accounting for more than one-third of the total, be-

long to the largest animal available to Easter Islanders: the common dolphin, weighing up to 165 pounds. That's astonishing: nowhere else in Polynesia do dolphins account for even as much as 1 percent of the bones in middens. The dolphin generally lives out to sea, hence it could not have been hunted by line-fishing or spearfishing from shore. Instead, it must have been harpooned far offshore, in big seaworthy canoes built from the now-extinct tall trees. Fish bones and shellfish occur in the middens but in only modest quantities, because Easter's rugged coastline and the steep drop-off of the ocean bottom provide few places to catch fish or shellfish in shallow water. To compensate, there were those abundant sea birds plus the land birds.

Comparison of early garbage deposits with late prehistoric ones or with conditions on modern Easter Island reveals big changes in those initially bountiful food sources. Porpoises and open-ocean fish like tuna virtually disappeared from the islanders' diet. The fish that continued to be caught were mainly inshore species. Land birds disappeared completely from the diet, for the simple reason that every species became extinct from some combination of overhunting, deforestation, and predation by rats introduced accidentally as stowaways in the colonists' canoes. This was the worst catastrophe to befall Pacific island birds, surpassing even the record on New Zealand and Hawaii, where, to be sure, the moas and most flightless geese became extinct, but many other species managed to survive. No Pacific island other than Easter ended up without any native land birds. Of the twenty-five or more formerly breeding sea bird populations, overharvesting and rat predation brought the result that only one now breeds on Easter itself. Even shellfish were overexploited, so shell sizes in the middens decreased with time because of preferential overharvesting of larger individuals.

The giant palm and all the other now extinct trees disappeared for half a dozen reasons that we can document or infer. Identified tree charcoal fragments from ovens prove directly that trees were being burned for firewood. Trees were being cleared for gardens, because most of Easter's land surface ended up being used to grow crops. From the early midden abundance of bones of open-ocean porpoises and tuna, we infer that big trees were being felled to make seaworthy canoes; the frail, leaky little watercraft seen by early European visitors would not have served for harpooning plat-

forms or for venturing far out to sea. Trees furnished the timber and rope not only for transporting and erecting statues, but undoubtedly for a multitude of other purposes. The introduced rats "used" the palm tree and doubtless other trees for their own purposes: every Easter palm nut that has been recovered shows tooth marks from rats gnawing on it and would have been incapable of germinating. From several types of archaeological evidence, we deduce that the clearing of forests began soon after human arrival, reached its peak around 1400, and was virtually complete by dates that varied locally between the early 1400s and the 1600s.

The overall picture for Easter is the most extreme example of forest destruction in the Pacific, and among the most extreme in the world: the whole forest gone, and all of its tree species extinct. Immediate consequences for the islanders were losses of raw materials, losses of wild-caught foods, and decreased crop yields.

Raw materials lost or else available only in greatly decreased amounts consisted of everything made from native plants and birds, including wood, rope, bark to manufacture bark cloth, and feathers. Lack of large timber and rope brought an end to the transport and erection of statues, stopped the construction of seagoing canoes, and left people without wood for fires to keep themselves warm during Easter's winter nights of wind and driving rain at a temperature of 50 degrees Fahrenheit. Instead, after 1650 the islanders were reduced to burning herbs, grasses, and crop wastes for fuel. There would have been fierce competition for the remaining woody shrubs among people trying to obtain thatching and small pieces of wood for houses, implements, and bark cloth.

Most sources of wild food were lost. Without seagoing canoes, the bones of porpoises, tuna, and pelagic fish vanished from middens by 1500. The numbers of fishhooks and fish bones in general also declined, leaving mainly just fish species that could be caught in shallow water or from the shore. Land birds and wild fruits vanished from the list, sea birds were reduced to relict populations, and the shellfish consumed became fewer and smaller. The only wild food source whose availability remained unchanged was rats.

In addition to those drastic decreases in wild food sources, crop yields also decreased, for several reasons. Deforestation led locally to soil erosion by rain and wind, as shown by huge increases in the

quantities of soil-derived metal ions carried into Flenley's swamp sediment cores. Other damages to soil that resulted from deforestation and caused lower crop yields included desiccation, nutrient leaching, and reduced rainfall. Farmers found themselves without most of the wild plant leaves, fruit, and twigs that they had been using as compost.

Those were the immediate consequences of deforestation and other human environmental impacts. The further consequences were starvation, a population crash, and a descent into cannibalism. Surviving islanders' accounts of hunger are graphically confirmed by the proliferation of little statues called *moai kavakava,* depicting starving people with hollow cheeks and protruding ribs. Captain Cook in 1774 described the islanders as "small, lean, timid, and miserable." Numbers of house sites in the coastal lowlands, where almost everybody lived, declined drastically in the 1700s from peak values between approximately 1400 and 1600, suggesting a corresponding decline in numbers of people. In place of their former sources of wild meat, islanders turned to the largest hitherto unused source available to them: humans, whose bones became common not only in proper burials but also (cracked to extract the marrow) in late Easter Island garbage heaps. Oral traditions of the islanders are obsessed with cannibalism; the most inflammatory taunt that could be snarled at an enemy was "The flesh of your mother sticks between my teeth."

Easter Island's chiefs and priests had previously justified their elite status by claiming relationship to the gods and by promising to deliver prosperity and bountiful harvests. They buttressed that ideology with monumental architecture and ceremonies designed to impress the masses, and made possible by food surpluses extracted from the masses. As their promises were being proved increasingly hollow, the chiefs and priests were overthrown around 1680 by military leaders called *matatoa,* and Easter's former complexly integrated society collapsed in an epidemic of civil war. The obsidian spear-points from that era of fighting still littered Easter in modern times. For safety, many people turned to living in caves whose entrances were partly sealed to create a narrow tunnel for easier defense.

What had failed, in the twilight of Easter's Polynesian society, was

not only the old political ideology but also the old religion, which became discarded along with the chiefs' power. Oral traditions record that the last *ahu* and statues were erected around 1620. Around 1680, at the time of the military coup, rival clans switched from erecting increasingly large statues to throwing down each other's statues by toppling them onto a slab placed so that the statue's neck would fall on the slab and break. The last observation of an erect statue was in 1838.

Ahu themselves were desecrated by pulling out some of the fine slabs in order to construct garden walls or burial chambers. As a result, today the *ahu* that have not been restored (that is, most of them) look like mere boulder heaps. When I drove around Easter, I saw *ahu* after *ahu* as a rubble pile with its broken statues. I reflected on the enormous effort that had been devoted for centuries to constructing them, and then remembered that it was the islanders themselves who had destroyed their own ancestors' work. I was filled with an overwhelming sense of tragedy. Easter Islanders' toppling of their ancestors' statues reminds me of Russians and Romanians toppling the statues of Stalin and Ceauşescu when the Communist governments of those countries collapsed. The islanders must have been filled with pent-up anger at their leaders for a long time, as we know that Russians and Romanians were.

4

Why were Easter Islanders so foolish as to cut down all their trees, when the consequences would have been so obvious to them? This is a key question that nags everyone who wonders about self-inflicted environmental damage. I have often asked myself, "What did the Easter Islander who cut down the last palm tree say while he was doing it?" Like modern loggers, did he shout "Jobs, not trees!"? Or "Technology will solve our problems, never fear, we'll find a substitute for wood"? Or "We need more research, your proposed ban on logging is premature"?

Similar questions arise for every society that has inadvertently damaged its environment, including ours today. It turns out that there is a series of reasons why people in any society — whether Easter Islanders, Maya, or ourselves — may make fatal mistakes that will look foolish to their successors. They may not anticipate a

problem because the problem is unprecedented in their experience: for example, today's overharvesting of the ocean's seemingly inexhaustible fisheries, for the first time in human history. They may fail to perceive the problem when it does arrive: for example, global warming today, initially difficult to distinguish from just the usual year-to-year fluctuations in temperature. Conflicts of interest may prevent them from addressing a perceived problem: for example, dumping toxic wastes into rivers is bad for people living downstream but saves money for the company doing the dumping. Some problems just prove too difficult to solve with current abilities: for example, no one has figured out how to eliminate the Dutch elm disease that reached North America. Probably all of those kinds of explanations apply to deforestation on Easter Island, but the most important reason there may be conflicts of interest. A chief's status depended on his statues: any chief who failed to cut trees to transport and erect statues would have found himself out of a job.

The Easter Islanders' isolation probably also explains why their collapse — more, perhaps, than the collapse of any other preindustrial society — haunts readers and visitors today. The parallels between Easter Island and the modern world are chillingly obvious. Thanks to globalization, international trade, jet planes, and the Internet, all countries on Earth today share resources and affect each other, just as did Easter's eleven clans. Polynesian Easter Island was as isolated in the Pacific Ocean as the Earth is today in space. When the Easter Islanders got into difficulties, there was nowhere to which they could flee or to which they could turn for help; nor shall we modern Earthlings have recourse elsewhere if our troubles increase. Those are the reasons why people see the collapse of Easter Island society as a metaphor, a worst-case scenario, for what may lie ahead of us in our own future.

Of the two new accounts of Easter Island's message that Flenley and Bahn and Van Tilburg have now given us, which would I recommend to readers? Both books are so interesting but so dissimilar that those of us attracted to history, exploration, and exotic societies will enjoy reading both. Those interested in none of those things but looking for a florid Gothic novel can read Van Tilburg's book and try to forget that it happens to be a true story.