# *b31* Extinctions of the New World megafauna< naïf, hypervirulent >

> "All creatures live bewildered." Krishna said in the *Bhagavad-Gita (Song Celestial)*.[1]
>
> ... we are the elephant who went lumbering down the trail and saw the bale of fresh hay and went for it and the ground opened up and we fell in the hole and now the Masai are standing around the rim and buzzards are parked in the trees... —Garrison Keillor, *Wobegon Boy*.[2]

"Most evolving lineages, human or otherwise," George C. Williams posits "when threatened with extinction, don't do anything special to avoid it. I presume that the last pair of passenger pigeons, once a very abundant bird in North America, now extinct, reproduced the same old way. Once the species had gotten extremely rare, it did nothing new and did not take any special measures, the way an individual [human] would if threatened with death." [3]

In Madagascar, huge flightless birds, about 3 meters tall and weighing half a ton, called "elephant birds" (*Aepyornis maximus*), which may have inspired Arabian tales of the roc (Arabic, *rukh*), went extinct about 400 years ago. Their eggs with a volume 7.5 liters, were the largest single cells ever in the animal kingdom.[4] Other megafauna (large-in-stature-animals) on this California-sized island off the coast of East Africa in the Indian ocean, vanished 2,500 years ago. These included pygmy hippos, giant lemurs that ranged up to the size of gorillas, and less familiar animals unique to Madagascar for which Ross MacPhee of the American Museum of Natural History named a new order of mammals Bibymalagasia that includes the insectivore *Plesiorycteropus*.[5]

In support of Cuvier's claim that extinction (*see* Topic *e9*), and not merely extirpation (local extinction), of species occurs, Richard Owen in 1840 cited flightless giant birds, the moa (too big to be hiding somewhere), that he had described from bones a missionary sent to England from New Zealand. So abundant at some North Island archaeological sites were bones of "moa" (means chicken in maori, and is Victorian misnomer for the passed-down name "te kura" for the once giant "red bird") that they were hauled off by the wagonloads for use as fertilizers. Trevor H. Worthy and Richard N. Holdaway in *The Lost World of the Moa*, 2002, emphasize that within the century after first settlement 3000 years ago of Tamatea's descents, moa bones were "rare to nonexistent," having been plentiful earlier in the middens of these ecology-changing stone age hunters who routinely set fire to the land and, inevitably, had transported in boat-stowaway rats.[6] And now children blithely sing W. Chamberlain's poem: "No moa [pronounced *more* in New Zealand] / No moa / In old Ao-tea-roa [the Maori name for New Zealand, rhyming with *more* and meaning 'land of the long white cloud'] / Can't get 'em / They've eat 'em / They're gone and there ain't no moa."[7]

Cry for extinct *Myotragus sp.* the once indigenous goat-like creature of the island of Majorca in the Mediterranean. This animal, had binocular vision which goats do not.[8] This may have evolved to help foot placement on precipitous rocky terrain but gave no winning advantage over the predaceous maneuvering of Spanish landers about 3500 years ago. Before, from studies of the bone structure of fossil assemblages of *Myotragus* (discovered ca.1902 by Miss Dorothea M. A. Bate),[9] these animals, unlike animals subject to predators, evidently almost all lived to reach old age.[10]

But commonly, humans with pre-Iron Age cultures, had little effect on large animals. This was so of buffalo and caribou herds in America, and kangaroos, to the size of *Macropus rufus,* in Australia. However, in North and South America, 13,000 years ago, suddenly went extinct some 135 species and 33 genera of mammals, which included almost all animals over 100 pounds (54 kilograms). Still existing bear, moose, caribou, beaver, bison and endangered giant otter are small stature species compared to Pleistocene American megafauna (giant species) of beaver, muskox, beautiful armadillo, camel, horse, mastodon, mammoth, and large-seed frugivorous gomphotheres and giant sloths,[11] that were preyed upon by giant carnivore species of lion, saber-tooth cats, and dire wolves.[12]

Body size and reproductive rate of living mammals allows inference of reproductive rates for their extinct members, and parallels between families for the same, has shown Christopher N. Johnson in 2002 that regardless of size, a low reproductive rate predisposed a species to extinction. One offspring per female per year, or less, weighs in favor of extinction. Low-fecundity life history of Pleistocene megafauna, which Johnson dubs the "bradyfauna" (slow beasts),[13] put these at risk.

The change to warm climate is no explanation for the megafauna die off. Warm times (interstadials) had been many during the Pleistocene Ice Age and these species *had coped* with the extremes of climate fluctuations and the accompanying latitudinal shifts of vegetation types. A new ecological factor in the New World was the arrival of paleohumans and the stone-tipped hunting spears which some devised and deployed. In Eurasia and mainland Africa by contrast, megafauna, of which many still survive, especially in Africa, declined in diversity *slowly*. In the Old World, megafauna have long been in the presence of humans, and are smart to us from before even when the Ice Age began.

Paul Martin in 1967 suggested that paleohumans upon their arrival in the New World had experienced a population explosion while they hunted slow moving, ambushable, large animals and then a population collapse when these went extinct as a result of decimations. Against this scenario, some say: "Too few found kill sites." To counter that, Martin says: "Too rapid were kills to register in the archeological record." Unlike animals that had evolved with humans in the Old World, naïf New World animals were not alarmed by human hunters.[14] Introduced diseases is another hypothesis.

Pathogens cannot survive if they kill all their hosts. Those that persist, co-evolve with some of these that become carriers. Nevertheless, a "hypervirulent" pathogen could extend its run of lethality by mutating rapidly and infecting new species.

Three bubonic plague pandemics are collectively responsible for the loss of 200 million human lives. Ring-a-ring a rosie (the first sign that a person has the plague is a red armpit lump with a white ring—swollen lymph node or buboe), / A pocket full of posy (nosegays were carried to be held to the nose when near the infected). / Ah-tishoo, ah-tishoo (violent sneezing when the disease, in its terminal pneumonic phase, causes the lungs to flood and the nose to run). / All fall down (the sprayed out bacterium is widely air-transmitted and all about catch the infection and most die)! The third plague is still ongoing but so diminished that most are unaware of the present danger of drug resistant species in rodents in, say, the Midwest. Paul-Louis Simond showed that from plague in the blood of infected rodents, infected fleas can transmit plague to humans when the rodents on which they prefer to live die or are killed.[15] Counter-intuitive moral: Don't kill the rats. That finding came soon after Alexandre Yersin isolated the plague germ (gram-negative bacterium *Yersinia pestis*)[16] early in its spread from south China in 1894. The second, "the Black Death," ended 1350 and had spread from the kingdom of Sicily, when Tatars, in the first recorded biological weapons offensive, hurled corpses of plague victims into a besieged city in 1346, starting what is recorded to have reduced by over one-third the human population of Europe (and, for the while, eliminated leprosy there by removing the human reservoirs of the causative organism, *Mycobacterium leprae*).[17] The first plague was the Justinian plague that lasted three centuries from the beginning of the 6th.[18]

We now know that newly emerging viruses, as Ebola (its animal reservoir is not yet known), do jump the species barrier. Influenza came from birds, Southeastern Asia Nipah virus came from pigs, and AIDS (Peter H. Duesberg notwithstanding) is caused, as Luc Montagnier's team in 1983 found,[19] by a retrovirus (that thwartingly evolves at a rate of up to a million times faster than that of animal DNA)[20]: In Cameroon, Gabon, Guinea, and Congo, through hunting or husbandry, ape and monkey meat is bush fare and in local cities is on the menu in middle-class restaurants.[21] Specifically, a study of the M, N, and O groups of human immunodeficiency virus type l (HIV-1) in 1999 [22] indicated that these represent three separate zoonoses (inter-species transmissions of infectious disease) to humans from the Congo bonobos (pygmy (*sic*) chimpanzees *Pan paniscus* first found in the 1930s)[23] and sooty mangabeys (range: Sierra Leone to Ghana) which harbor a related simian immunodeficiency virus (SIVcpz). (In humans, 62% of 1,415 infectious diseases are zoonoses.)[24]

The mummified face and hands of the Pharaoh Ramses V (in the Cairo Museum) who died in 1157 BCE show the pocked ravagement, often to blindness, of the survivor of smallpox which viral disease had a 30 percent mortality rate and was one of the world's greatest killers. May 8, 1980, Frank Fenner (1914-2010) of the World Health Organization certified that smallpox (the variola virus), a scourge for more than 3,500 years, had been eradicated from planet Earth.[25] It was the first, and so far the only, infectious disease to have been eliminated from nature by human effort. Even so, the variola virus, still exists informs Ed Regis in his review of *Scourge* by Jonathan B. Tucker, "raising the possibility that smallpox might eventually reappear in humans (there are no known animal hosts of smallpox).[26] Officially there are only two stocks of the virus, one at the US Centers for Disease

Control and Prevention in Atlanta, the other at a Russian laboratory in Siberia. Unfortunately, there are several other potential sources. Corpses of smallpox victims preserved in permafrost or dry crypts might hold intact virus particles. Lost, forgotten or intentionally withheld samples left over from the global eradication campaign might be waiting in freezers somewhere in the world, unrecognized but still viable." Less speculatively, of available 19 bacteria and viruses vetted by Shiro Ishii for Japan's bio-warfare, half-a-million Manchurians succumbed to plague, cholera, paratyphoid and anthrax used in attacks in 1931. Now too is the prospect of constructing the viruses afresh from the DNA sequence data. For the plague, such data have been available in the open literature since 1993.[27]

Recently, Ross MacPhee has suggested that humans by their arrival in the New World inadvertently introduced diseases that killed the megafauna. This hypothesis uses the analogy that Europeans are known to have introduced smallpox (true), malaria (false—Spanish conquistadors upon arrival were straightway guided by indigens to the miracle, and for long, the only malaria cure, Jesuit's bark—quinine extracted from the bark of the Andean *Cinchona* tree, a close cousin of coffee), and other diseases (but not tuberculosis which was endemic) to Amerindians. (Malaria's known worldwide reservoir is in humans, mice, birds, porcupines, monkeys, apes, bats, snakes, and flying squirrels).[28] Immediate objections are that those diseases did not cause extinctions, and what plague brought by humans or their attendant animals, could have jumped the species barrier to kill ground sloths, giant camels, horses, mastodons, and mammoths? But, the MacPhee hypothesis has the appeal of being testable.[29] The DNA of the pathogen hypothesized could be identifiable in the variety of extinct megafauna that have left frozen, mummified or pickled remains. Fossils of these from before the arrival of humans should not have DNA of the same pathogen. And that pathogen could survive in carriers. For example, feline immunodeficiency virus (FIV) is lethal to domestic cats but is carried as non-lethal strains in 25 species of wild cats.[30]

Today, in Australia the only still surviving, indigenous, giant animal is the kangaroo. The country's aridity has increased, through the last ice-age's end (11,800 years ago), from the time of the Last Glacial Maximum (19,000–23,000 years ago). Before, and always during Pleistocene glacial times, moister climates were throughout the latitudes and longitudes of Australia. It was deep within the last of these climatically benign times when 23, long successful, megafaunal genera (giant 3 meter high kangaroo *Procoptodon*, marsupial equivalents of rhinoceroses and leopards, Komodo-dragon-like 1-ton carnivorous lizards, giant land-going crocodiles, and giant birds as was *Genyornis newtoni*) went abruptly extinct. Undisturbed bones of these dated by $^{230}Th/^{234}U$ of enclosing "flowstones" and optical luminescence of associated quartz and feldspar grains, gives the time of Australian megafaunal extinction to have been 46,000±5,000 years ago. Significantly, the same dating techniques show that the earliest human artifacts in Australia date back to 56,000±4,000 years ago. Jared M. Diamond in 2001 is not equivocal: "These extinctions look more than ever to be a matter of not what but who dunnit."[31] As long ago as 1824, John Fleming (1785-1857) had reasoned (unfashionably for his time) that it was people, as was certainly so for the dodo.[32] ❑

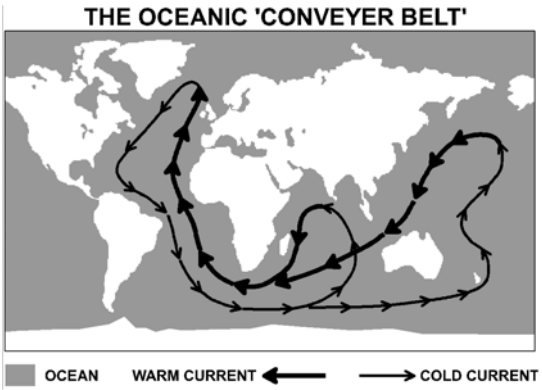


*Figure b32.1* **Oceanic "conveyer belt" schematic**
Beneath the familiar wind-generated surface currents of the oceans, is an ocean-wide thermohaline current, dubbed the oceanic "conveyer belt."[1] In the Pacific and Indian oceans, wind-pumped upwelled seawater is sunlight warmed while it flows as wind-driven surface currents. Increase of its salinity in regions where more water is evaporated than is received as rainfall, makes it dense enough to sink to mid-ocean "levels" (depths) and advect as a density driven current around the south of Africa to the Atlantic-ocean north. There it meets cold water which forces it to rise to the sea's surface. Exposed it loses heat and although its salinity is decreased by rain and glacier meltwater, cooling increases its density until it sinks to flow, completing the loop, as a cold under-countercurrent back to the Indian and Pacific oceans. The current's flow volume, Wallace S. Broecker has calculated, is more than a hundred Amazon Rivers, and heat energy input into the Atlantic north is to a third of what Sun delivers.[2]