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AN EVOLVING GENIUS: THE EXTRAORDINARY EARLY LIFE OF CHARLES DARWIN

by Douglas W. Schwartz

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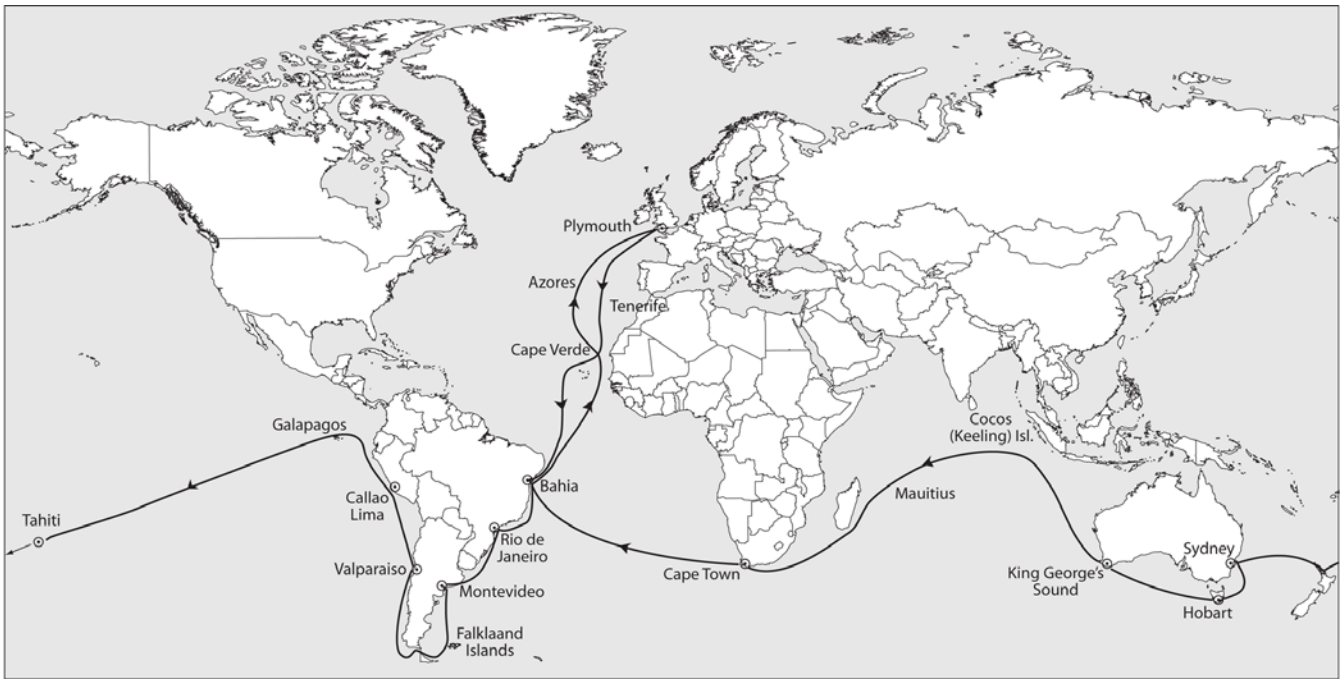
Shakespeare, Mozart, Da Vinci, Einstein—how did they become so brilliant that they were capable of creating those supreme human achievements we recognize as hallmarks of genius? There are many paths to brilliance. I've been studying one of them—the early life of Charles Darwin and what led to his development of evolutionary theory.

I have followed Darwin's trail around the world searching for how, before the age of thirty, he made important advancements in geology and created a theory that underlies the entire field of modern biology. For those committed to a secular explanation, Darwin's theory illuminates the fluorescence and diversity of <u>all</u> life.

Young Darwin

Darwin spent his youth with loving sisters and a brother who lived in the era of Jane Austin*'s Pride and Prejudice*. Their home, near the Welsh border, was in the quaint market town of Shrewsbury, England, where Charles was born 200 years ago on February 12, 1809, when Britain was launching its industrial revolution. Darwin's mother died when he was only 8. Some research suggests that a parent's death when a child is young encourages a quality of independence, which Darwin possessed in full throughout his life whatever its origin might have been. Darwin's father was a successful physician, a tall, enormous man of 350 pounds—the biggest man Charles said



Map of Beagle Voyage. Illustration courtesy Marcia Bakry. Based on Wikimedia.

he had ever seen. After his wife's death, Dr. Darwin grew melancholy, quick-tempered, and domineering and sent Charles to a strict Anglican school that stressed rote learning. Young Charles grew bored with this method of learning and soon became a lackluster student. But his life was full of other stimulation, including his father's library full of books on natural history, a collection of old bones and animal skins, and a greenhouse overflowing with plants.

The Darwin home by the Severn River was above a tangled bank of trees with spider webs, vines, paths leading to woodlands, and pastures that Charles loved to explore. One of his favorite books was Rev. Gilbert White's early classic *The Natural History of Selborne*. He was inspired by White's patient natural history observations of neighborhood plants and animals. On his long solitary walks, Charles began watching butterflies and birds and collecting eggs, minerals and rare insects. By the age of ten, Charles, the inept student, was becoming a keen pupil of natural history, prompting his uncle to describe him as having "an enlarged curiosity."

Charles loved to fish and when he was 15 an uncle taught him to shoot and hunt. These activities along with horseback riding and hiking over the nearby hills became Charles' passions, which he pursued with energy and enthusiasm—qualities that characterized all his early years. His fascination with butterflies, birds, insects, hunting, chemistry, hiking, horseback riding, and fishing unexpectedly became valuable skills for him, but his strict father saw them only as distractions from his school work. In a rage that Charles remembered word-for-word throughout his life, his father roared: "You care for nothing but shooting, ….and rat-catching, and you will be a disgrace to yourself and all your family" (Darwin 1959: 30). These were harsh words for a boy with no mother to comfort him. There has always been a question whether Darwin's father contributed a "tension" that was related to Charles' desire to achieve.

Darwin at Edinburgh and Cambridge

In exasperation over Charles' lackluster studies, his father withdrew him from school at age 16 and sent him to the University of Edinburgh to study medicine. Being a dutiful son, Charles threw himself into his class work. But, again, he became disenchanted by monotonous lectures and was appalled when he watched a gruesome surgery on a screaming child (at this time painkillers were not in use). Now, he was more determined than ever that he would not become a physician.

Charles returned to his passion for natural history and met a professor of invertebrate zoology, Dr. Robert Grant, who regularly took students to the Scottish coast to collect invertebrates, dissect and study them, write up their results, and deliver and discuss papers at a student natural history society. This was Darwin's first formal taste of science and he was exhilarated. Grant also advocated the unpopular theory that species could transform and was an admirer of the book *Zoonomia*, written by Darwin's grandfather in the late 1700s, which described species transformation. This book was soundly ridiculed since church doctrine at the time held that species were immutable. Robert Grant became the first of Darwin's many mentors—men who were influential in helping Charles with guidance, advice, support, tutoring and inspiration.

After two years of loathing medicine, Darwin left Edinburgh without a degree. But, instead of returning home, he traveled, hunted, and visited with relatives. His exasperated father, who insisted that Charles still needed a profession, directed that he enroll in Cambridge University to become a clergyman. Charles was ambivalent about this decision but reluctantly agreed. Once more he tried to be a dutiful student but again found the lectures uninspiring.

At this time there was a popular new hobby, competitive beetle collecting, which caught Charles' lively interest. Charles wrote about his enthusiasm in pulling bark from an old tree, seeing two rare beetles, and seizing one in each hand. Then, seeing a third, a new kind, which he couldn't bear to loose, but with no hands free, he popped it into his mouth. The beetle ejected an intensely acrid fluid, which burnt Charles' tongue so that he spit it out and regrettably lost it.

At Cambridge, Darwin read Alexander von Humboldt's thrilling account of his South American explorations in his *Personal Narrative of Travels to the Equinoctial Regions*…, which became a model for the romantic tone of Darwin's future popular writing and also inspired a plan of traveling to the tropics, which did not materialize. Darwin also met the inspiring professor Rev. John Henslow, who became another extremely important mentor and influenced Darwin's "whole career more than any other" (Darwin 1959: 44). Henslow was an outstanding botanist and his ability "to draw conclusions from long-continued minute observations" particularly impressed Darwin. He

was so inspired by Henslow and the writings of others that he wrote of a "… burning zeal to add…the most humble contribution to…natural science" (Darwin 1959: 47). But, Charles' interests in natural history had led him to neglect his four years of class work and only after last minute cramming did he graduate though without honors.

Just as Darwin was graduating, Professor Henslow recommended that he be an assistant to a leading English geologist, Professor Adam Sedgwick, who was studying the ancient rock strata of northern Wales. Charles accepted enthusiastically and for three weeks the two hiked over the "wild places" of Wales, which gave Charles an exceptional opportunity to learn the identification of rock types, interpret and map rock strata, and study fossils. Darwin's energy and stamina were obvious to Sedgwick who became another of Darwin's mentors. After observing how Sedgwick worked, Darwin wrote "nothing before….made me….realize….that science consists in grouping facts so that general laws....may be drawn from them" (Darwin 1959: 48).

"The Most Important Event in my Life"

As the Wales project was ending, Darwin received a second amazing invitation, which highlights the role serendipity played in the development of his career. A letter from Professor Henslow i
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1959: 51).

"The beetle ejected an intensely acrid fluid, which burnt Charle's tongue." Illustration courtesy Gene Lawrence, artist. Published in Anne Weaver's book, "The Voyage of the Beetle."

The *Beagle* was a 90 ft. long, square-rigged brigantine that had been ordered to make accurate coastline charts in support of Great Britain's expanding maritime empire and to record any new resources they discovered. Darwin was 22 years old in December 27, 1831, when the *Beagle* left England and headed into the Atlantic, where it immediately encountered one of the worst storms Capt. Fitzroy had ever experienced. For days Darwin lay in the hammock of his tiny cabin, severely seasick and drinking only tea. But, as soon as the *Beagle* entered calm tropical seas, Darwin was eagerly on deck netting plankton, jelly fish or whatever he could catch, study and draw. The voyage gave him a great deal of time to read through the ship's extensive scientific library, including a newly published book, *Principles of Geology,* by a leading geologist named Charles Lyell, that Capt. Fitzroy had given him at the beginning of the voyage. Lyell hypothesized the geological history of the earth not as shaped by great catastrophes but rather as an ever changing system of rising and falling land masses regularly eroding and filling, just as uniformly happens in the contemporary world. This approach came to be an anchor of all Darwin's future geological work.

Cape Verde Islands

After three weeks at sea the *Beagle* arrived at the Cape Verde Islands, an archipelago of old volcanoes 450 miles off the west coast of Africa. The ship landed at the Port of Santiago where Darwin was about to enter a world totally different from his green English homeland. He landed on a rugged, black coastline, saw remnant volcanoes, and the "rich colors of the lush tropical vegetation in its few irrigated valleys." For Darwin just to

hear "…. the notes of unknown birds" made it a glorious day "like giving a blind man eyes" (Darwin 2001: 23).

The majority of Santiago was sparsely vegetated, making it an ideal place for Darwin to practice his newly acquired geological skills. Santiago's dramatic geology motivated him to go far beyond mere description. He was anxious to know how this unique landscape was formed, a good example of how time and again Darwin chose the right research question to ask. He first studied the shoreline and collected washed up pieces of shell and coral that were mixed with volcanic rocks. Then he discovered a striking white band in the cliff above him and wondered why it was there. Looking for the larger story, as he regularly did, on closer inspection he found the band was composed of millions of tiny coral and shell fragments that had been baked into a hard layer. In the interior he examined old volcanic cones and consolidated lava flows.

From these observations he formulated a hypothetical sequence of geological events, which suggested that on the ocean floor at the edge of the original volcano there accumulated a deposit of coral and shell fragments. These were later covered by ash from a subsequent volcanic eruption, which also raised the whole island above sea level, exposing the white band under a layer of volcanic debris. Darwin further recognized that the shells in the white band were like those he had found near the shore, leaving him to conclude that the islands' volcanic activity must have been quite recent. This conclusion ran counter to the then current geological thinking that assumed all volcanic activity was quite ancient. Thus, within the first two days of Darwin's first overseas visit, he had built on the work of others, added his own original insights, and proposed an elegant explanation for an intricate geological puzzle. In addition, he was already challenging scientific authority, a quality that would be common in all his later work.

Darwin was elated with his "white band" theory, and since in the young science of geology there had been little research in the far corners of the world, it dawned on him, as he recorded decades later in his autobiography: ".... I might…. write a book on the geology of the various countries (I) visited, and this made me thrill with delight" (Darwin 1959: 55). Thrill, because now as he traveled over the world he had a clear sense of purpose, a purpose that would motivate and direct his efforts for the rest of the voyage. During only two and a half weeks on this desolate Cape Verde Island, Darwin had found a profession.

The Jungle

The *Beagle* now sailed southwest across the Atlantic Ocean, landing at the romantic tropical port of Bahia, Brazil. While Fitzroy focused on charting the coastline, Darwin went ashore where he found another new world. On February 29, he wrote: "walking in the forest …the day passed delightfully….the …. luxuriance of the vegetation… elegance of the grasses, the novelty of ... parasitical plants, the beauty of the flowers, (and) the glossy green of the foliage …" Since most geological formations were covered by lush vegetation, Darwin concentrated on the "sublime grandeur of lofty trees, radiant flowers and fruits, bizarre plants, fantastic birds and strange insects" (van Wyhe: 116). But, even with all this abundance he was careful to collect only specimens he had time to tag, record, and pack for shipment back to England. In the Brazilian jungle Darwin's interests in biology broadened and over the next six months he immersed himself in the profusion of Brazil's tropical animals and plants.

Patagonia

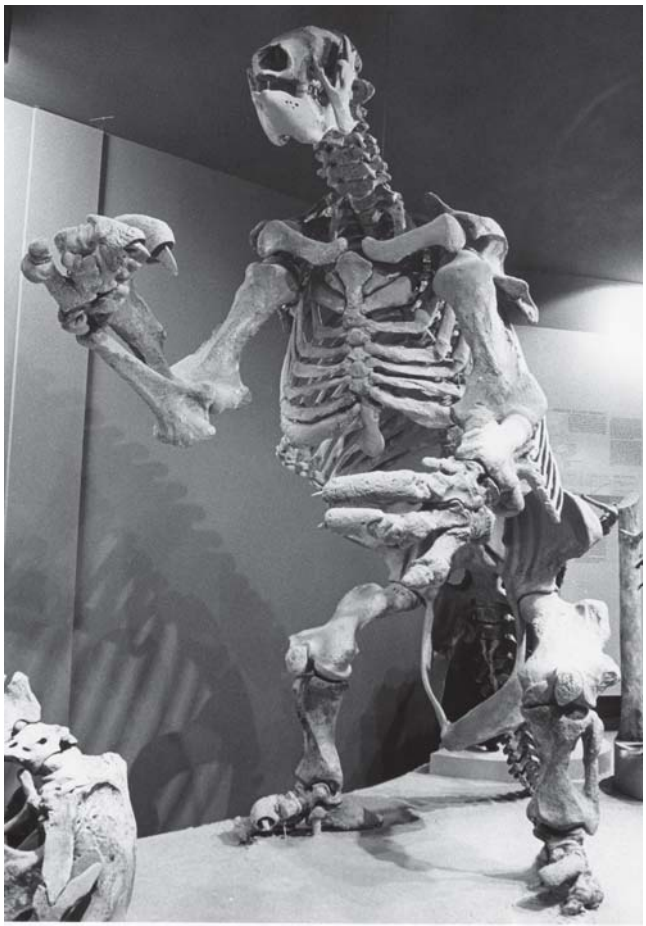
When the *Beagle* repositioned to the south and began its longest assignment, charting the coast of Patagonia, Darwin was again in a new environment, a raw frontier scarcely known to Europeans but which was surprisingly productive for him. He recorded more strange animals like the armadillo, and he was intrigued by the rheas and the guanacos. The rhea is a shy, solitary flightless bird, a distant South American relative of the ostrich, with a smaller relative living in an adjacent territory to the south. The guanaco is a species of South American camel, a wild relative of the domesticated llama, which he found also had a smaller variety in an adjacent territory. In both cases this juxtaposition of small and larger animals prompted him to question why two different but related types would live so close to one another. One of a growing number of small puzzles Darwin set aside to examine later.

One of his aspirations was to discover some large fossils since in all the collections of Europe there was only a single giant fossil from South America. If he could find more such fossils, he thought it would help him "…take his place among the men of science" (Darwin 1958: 83), a reflection of his deep desire to excel. The sparse vegetation of Patagonia made it a perfect place to search for fossils, and with Darwin's amazing luck he soon discovered a treasure trove. He found a huge Megatheriam skull,

which means "great beast," not a dinosaur but a large, strange-looking Ice-Age ground sloth that is related to the tiny modern tree sloth. Its powerful claws could pull down whole trees in search of food. He also found the nearly perfect skeleton of another large ground sloth and a huge, extinct armadillo, plus a Toxodon, a short-legged rhinoceros-size animal related to the small modern capybara, and a large camel-like animal related to the modern tapir plus the remains of several mastodons.

Since the bones he was finding were mixed with fossilized seashells similar to species he recovered along the nearby shore, Darwin speculated these big animals were geologically quite recent. He felt even more sure of that when he found the skull of a Mylodon, another big ground sloth, with "… bones …..so fresh…that they contain animal matter**"** (Darwin 1961: 147). Based on the large number of bones he was recovering, Darwin concluded that: "…the whole area of the pampas is one wide sepulcher of these extinct gigantic quadrupeds" (Darwin 1839: 174). He reasoned that some of these large fossils were "antecedent" to modern, smaller "allied races." These two concepts, "antecedents" and "allied races," led him to conclude that the large animals who once lived in Patagonia died off but had smaller descendants who are living today. But, then, how could species die off and change if they were supernaturally created? Another thought he filed away for later.

When the *Beagle* sailed further south, it hit a submerged rock, and Fitzroy decided to stop at the mouth of the Santa Cruz River so the ship could be beached, checked, and its keel repaired. During this time Fitzroy, Darwin, and some other crew explored the river basin, a broad canyon cut through the Patagonian tableland. Its fast flow and "fine blue color with a slightly milky tinge" suggested it had a glacial origin in the Andes. This long, hard expedition gave Darwin an unusual opportunity to examine a nearly complete east-west cross-section of southern South America. He found a landscape of stepped strata that stretched all the way west to the Andes. Near the coast he saw a surface apparently laid down on the sea floor, while further inland he encountered great lava beds that also had originated in the ocean and then gradually had risen above the water. Darwin hypothesized that all the way from the Straits of Magellan north for 1200 miles "…the whole of the east coast of southern South America has been elevated from the ocean…one grand formation…that… began from seas too deep for life...were rapidly elevated and … within a proper depth life commenced.. The elevations rapidly continued, land was produced on which great quadrupeds lived" (Herbert: 159). Darwin had taken a broad continental view and proposed a bold geological story.



Megatherium americanum ("Great Beast") stands about 12 feet high on display at NMNH. Photo courtesy Smithsonian Institution.

After more than two years charting the coast of Eastern South America, the *Beagle* now sailed south to the waterways of Terra del Fuego and into its turbulent seas, moving through gloomy channels where wind and tide ran together in the Magellan Strait, a recently discovered and seldom traveled passage. Moving through the channel, the *Beagle* encountered temperatures far below freezing, plus dangerous icebergs that had calved off the enormous blue glaciers, thrusting out from the base of the massive snow-covered southern Andes. For days the *Beagle* sailed in waters of "overpowering force," and the crew was constantly worried they might crash into hidden rocks and sink or drown in the freezing waters. Finally,

and happily, they reached the Pacific Ocean and turned north for a 1700 mile sail toward Valparaiso, Chili.

The Andes

From the ship Darwin watched the Andes and wrote, "who can avoid admiring the wonderful force, which has upheaved these mountains....and …. the countless ages … it must have required …." (Darwin 2001: 285). These were the two questions he now was pondering: what force caused the Andean uplift? and how long had it taken? As they sailed along the southern coast of Chile, Mount Osorno came into view—a massive 7,000 foot-high perfect snow-covered volcano, standing in front of the main Andean range, when suddenly it began "spouting … volumes of smoke," then on January 15, 1835, there was a spectacular, fiery eruption. Later, he heard that several other volcanoes in the region erupted simultaneously. Darwin was seeing the full force of nature that few European geologists had experienced, which made his observations another major contribution to modern geology.

Further north, Darwin was exploring a forest near Valdivia, Chili, when on February 20, 1835, he felt the ground shake violently below him. It was a gigantic earthquake during which he sensed: "the world… move beneath our feet like a crust over a fluid…." (Darwin 2001: 292).This enormous quake completely destroyed the nearby town of Concepcion, Chile, and seventy other outlying villages. After the quake, he examined the shoreline near Concepcion and found that shells once on the beach had been forced up some nine feet, just what he had envisioned for Patagonia, a land mass dramatically raised out of the sea. With the Orsorno eruption and the Valdivia quake, Darwin experienced first hand natural forces instantly transforming the earth. He wrote: "The earthquake and volcano are parts of one of the greatest phenomena to which this world is subject." He was anxious to know how all this related to the origin and building of the Andes.

Leaving the coast and traveling inland with horses and guides, he set off on a dangerous, determined 22-day journey across the Andes, searching for clues to the mountains' origins. He was frequently in danger from deep precipices, altitude sickness, and blizzards, but this did not deter him from seeing the beauty that was everywhere around him. He wrote, "… the sky an intense blue, the profound valleys, the wild broken forms…the bright coloured rocks, contrasted with the quiet mountains of snow, a scene I never could have imagined…this … view stands distinct in my memory from all others" (Darwin 1890: 385).

On cliff tops 1,000 feet high he found recent seashells and at 12,000 feet fossilized seashells that suggested "….the enormous mass…peaks…are so very modern…as to be contemporaneous with the plains of Patagonia." Also high in the Andes Darwin found evidence of the force behind the uplifts —large masses of red granite that was once molten lava and had been extruded from deep below the surface, elevating the overlying rock by a long series of spectacular upheavals. Here were "… manifest proofs of excessive violence" suggesting "…. the world (was) older than geologists think" (Darwin 1959: 232). This conclusion made Darwin one of the mid-19th century geologists who established our understanding of deep geological time (Eldredge: 112). He had conceived of his "great system" of Patagonian uplift long before the concept of tectonic plates was developed, an illustration of his growing originality, self confidence, and readiness to explore how the accumulation of little changes can produce significant results wherever they occur.

The Enchanted Islands

The *Beagle* sailed away from the Andean coast and traveled 600 miles west with Darwin looking "… forward to the Galapagos with more interest than any other part of the voyage" (Darwin 1959: 234). This was in anticipation of their famed volcanic geology. He had no idea at the time the influence the plants and animals of the Galapagos would have on his future. At first landfall Darwin discovered a shoreline of black, dismal looking heaps of lava starkness. He reasoned this shoreline had originated from the eruption of sub-oceanic volcanoes that had risen out of the open sea to create remote new lands, which he compared to newly formed planets. The unique animals he found were nearly fearless with so few predators on the islands. This gave Darwin an exceptional opportunity to observe and collect many important new species, including the marine iguanas that lived nowhere else in the world. In the forested inland he found a large, land-based, cactus-eating iguana. On the mountaintop of one island he discovered a high cloud forest with lichen-draped trees and giant tortoises, which weighed up to 200 pounds, some seven feet in circumference. As he roamed the islands Darwin wondered where these unusual species came from, and he wrote, "….it will be …interesting to find…to what centre of cre-

ation the…beings of this archipelago must be attached" (Darwin 2001: 356).

At first he thought the islands were too far from the mainland to have "effectively… receiv(ed) any migratory colonists." So, perhaps these animals were newly created when the islands emerged from below the sea. This conclusion would have been consistent with the then current opinion about the origin of new life. While Darwin was not ready to abandon special creation as an explanation, he was gradually opening up to other possible causes. He wondered if the local Galapagos species of mockingbirds might be related to those he had seen on the mainland of South America. But then why were the Galapagos species different?

As he walked over the nearly unexplored islands he found other new species of animals and plants and finch-like birds with a diversity of eating habits. Some were feeding only on cactus, some searching on the ground for plant seeds, and others fed in trees, eating insects and leaves. He noticed that the different kinds of feeders had dissimilar beaks, adapted he thought to what they ate. Local residents also told him that each island had its own type of tortoise with distinctive shell coverings, and that mockingbirds were different from island to island as were many of the trees. But this island species diversity, while intriguing, did not at the time cause an epiphany in Darwin's thinking. The deeper meaning buried in the Galapagos species came only much later after he had time to put together more clues.

Tahiti!

After less than a month the *Beagle* left the Galapagos and sailed west 2500 miles to Tahiti, where Darwin discovered the kind of place he had dreamed of as a boy, a tropical island with long brilliantly white beaches overhung by coconut palms. Disembarking, the crew were greeted by a joyful throng of islanders. While he was on Tahiti for only eleven days, Darwin made another major scientific breakthrough—the geological origin of coral reefs and atolls. He climbed a 3000 foot-high mountain and saw awesome waves break over the outer edge of the encircling reef. He knew from earlier studies that the coral polyp animals only live in the warm water, close to the ocean's surface where ocean currents brought food. This observation became part of Darwin's new idea of how coral reefs form. He canoed out to the reef and was amazed that these tiny coral polyps had built such a mountainous ring around the island, leaving the lagoon inside the reef glassy calm.

Thinking back over his work in Chile, Darwin reasoned that there must have been an equilibrium in the earths' masses. If the Andes rose by a series of massive uplifts, then this movement should have been balanced by the adjacent Pacific basin slumping. Based on this hypothesis, Darwin envisioned that a volcano erupting on the ocean floor would grow until it rose above sea level. Then coral would grow in the shallow water around its base. As the sea floor subsided, the volcano would then gradually descend lower and eventually disappear under water's surface, while the encircling coral would grow upward to stay in the shallower, warmer water. Finally, only a ring of coral would show above the surface as an atoll.

In this work, Darwin was developing a research style that would emerge later during his work on evolution. It involved combining insights from several fields of inquiry, including geology, zoology, botany, and oceanography. Each of these disciplines stimulated his thinking in the other areas, with all contributing to his final conclusion regarding the origin of coral reefs.

Coral reef, Tahiti. Photo courtesy Douglas W. Schwartz.

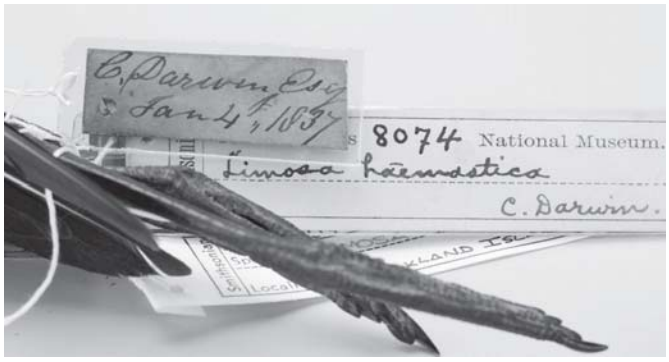
Homeward Bound

After Tahiti, the *Beagle* began its much anticipated return to England by way of New Zealand, Australia, the Indian Ocean and the island of Mauritius. The *Beagle* voyage had changed Darwin forever. He had left England, a land of peace and green pastures, to discover a world of violent volcanoes, earthquakes, powerful glaciers, rising mountains, turbulent seas, jungles, and vast open spaces, during which his "….love for science gradually preponderated over every other taste" (Darwin 1958: 53).

From Mauritius, the *Beagle* sailed to the South Africa's Cape of Good Hope because Darwin wanted to visit the famous philosopher Sir John Herschel whose writings had influenced him at Cambridge. In their conversation Herschel may have used his phrase "mystery of mysteries," an expression which resonated with Darwin's growing interest in species transformation and stayed with him for decades as he developed his evolutionary theory.

Sailing on to the island of Ascension, where they picked up mail, Darwin received word that some of the technical letters he had sent to Prof. Henslow during the voyage had been read by Henslow at a scientific meeting and had been widely praised. Darwin's fossil finds also were considered very important. Darwin was thrilled, revealing, as he wrote, "how ambitious I was" (Darwin 1959: 55). But, his ambition had a wider aspiration for in thinking about his future, he wrote that he was looking forward to "…a harvest however distant…when some fruit will be reaped, some good effected" (Darwin 1961: 482). What Darwin did not know was that at just this time his geology mentor Prof. Sedgwick had visited Darwin's family and expressed the opinion that Charles should take a place among the leading scientific men.

The *Beagle* then sailed back to Brazil so Fitzroy could recheck his measurements, another long trip that gave Darwin more time to rethink his observations. Reconsidering the Galapagos, he wrote in his ornithological notebook that if the mockingbirds on the Galapagos were similar to those in Chile, but different on each island, then this idea "… would undermine the stability of species" (Barlow: 262), a clear indication that he was now much more open to the idea of what he was now calling species transmutation, which he much later called "evolution."



A label written in Darwin's handwriting attached to a Godwit, a bird captured in the Falkland Islands. Photo courtesy Chip Clark, NMNH.

A Theory by Which to Work

At the beginning of August 1836, the *Beagle* finally turned toward England, carrying home a young man who, over the past five years and fourteen thousand miles, had changed from a casual collector of nature into a full-fledged scientist. On October 2, 1836, when the *Beagle* reached England, Darwin moved to London immediately to begin "the most active...[two years] which I ever spent" (Darwin 1959: 56) and perhaps his most creative. Darwin became a very public scientist, unpacking his thousands of carefully tagged specimens and distributing them to various specialists for analysis. He delivered papers on geology at scientific meetings and edited his *Beagle* journal for publication.

As the experts' analyses of his specimens arrived, everything changed. They reported that the Galapagos mockingbirds were separate species from those on the mainland and were in fact three different species. The large fossils were indeed antecedent to related smaller existing species in South America. The Galapagos finches were, in fact, twelve distinct new species related to species on the mainland. The land iguanas were distinct species from island to island, as were the giant tortoises.

These results represented an explosion of speciation. In the face of this overwhelming evidence, Darwin accepted the dangerous idea of species transmutation as a matter of fact and immediately began a secret effort to determine how that process might work. The nature of his thinking process is revealed by a branching diagram he drew at the time, which represented for him how new species might arise in a pattern of continual diversity. However, he was not yet positive about this and added to his

sketch the words "I think." This visualization led the psychologist Howard Gruber to characterize Darwin's thinking as "favoring images of wide scope," just as on Cape Verde, in Patagonia, the Andes, and Tahiti, Darwin thought about the larger picture and looked for answers as to how it came about.

Darwin had observed that among all species there was individual variety and, when food was in short supply, there would be competition between individuals, what Lyell had called a "struggle for existence." But Darwin, while convinced that species transmutated, could not yet tie all of these pieces together. He began searching for ideas, reading books on philosophy, science, and metaphysics. Then, on September 10, 1837, he read a book on social welfare by Thomas Malthus called *Essay on the Principle of Population*. Malthus maintained that much of human suffering occurs because its population increases faster than the food supply, leading to famine, disease, and conflict. The concept of over-population was the missing factor Darwin had been seeking. He recognized that not just humans but all species overproduce offspring and given the variation among individuals in any species during times of food shortage, there would be a struggle to survive. The weak die and the most fit would survive and pass their superior qualities to their offspring, allowing them to evolve. As Darwin wrote: "…favorable variations…(are) preserved and unfavorable ones…destroyed. The result…the formation of a new species" (Smith: 65).

Finally, at the age of 29, Darwin had a theory by which to work, one that would cause a sea change in the history of ideas. It is often assumed that the inspiration for his evolutionary theory came either from the Galapagos finches or his reading of Thomas Malthus. But, for me, the foundation of his colossal creativity arose from a much more complex web of interrelated factors, including independence, enlarged curiosity, energy, tension, mentors, in-depth knowledge, serendipity, originality, desire to excel, determination, web of inquiry, and the asking of profound questions. It was only when all of these qualities coalesced that there emerged this enormous creative ability during the extraordinary early life of Charles Darwin.

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http://aboutdarwin.com/index.html
http://www.pbs.org/wgbh/evolution/darwin/origin/

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DARWINISM, SOCIAL DARWINISM, AND THE "SUPREME FUNCTION" OF MOTHERS

by Sarah Blaffer Hrdy

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[Editor's Note: Sarah Hrdy is a sociobiologist whose work has focused on female reproductive strategies in both humans and non-human primates. Her graduate field work, detailed in *The Langurs of Abu: Female and Male Strategies in Reproduction*, was the first book on wild primates to devote equal attention to both sexes. Among these South Asian monkeys, females have adapted to the threat of infanticide by immigrant males by adopting polyandrous mating habits to confuse the paternity of their infants. She also documented how mothering is shared among groups of related females, a practice she termed "alloparenting." Her subsequent book, *The Woman That Never Evolved*, focused more broadly on the role of female primate strategies in evolution. A 1984 edited volume (reprinted in 2008) with G. Hausfater, *Infanticide: Comparative and Evolutionary Perspectives,* explored the evolutionary advantages of the seemingly inexplicable practice of infanticide, as well as the social and ecological variables contributing to its use. In the book *Mother Nature: A History of Mothers, Infants and Natural Selection*, from which the excerpt below derives (pp. 12-25), she explores the tensions between what is advantageous for the evolutionary success of the mother's genes and the survival of each particular infant. Along the way, Hrdy considers such topics as the evolutionary causes and consequences of "cooperative breeding" (a breeding system with alloparental care and provisioning of young), the reasons for menopause, the emotional and physiological consequences of lactation, why adoption is easier in humans than in many non-primate mammals, the role and optimal number of "fathers," why female modesty evolved, why babies are cute, and the reasons why some cultures and socioeconomic groups prefer sons. Her newest book, *Mothers and Others: The Evolutionary Origins of Mutual Understanding*, due out in early 2009, explores the psychological implications of humankind's long legacy of cooperative breeding. Dr. Hrdy is Professor Emerita of Anthropology at the University of California at Davis and is herself the mother of three grown children. A.S.B.]

According to Genesis, God created first heaven, then earth, then each variety of plant, every species of nonhuman animal, and, on the sixth day, man, and from one of his ribs, or perhaps his thigh, woman. In 1859, Charles Darwin proposed a revolutionary alternative to the biblical account. He titled his alternative genesis *On the Origin of Species*.

Darwin proposed that humans, along with every other kind of animal, evolved through a gradual, mindless, and unintentional process dubbed natural selection. Morally indifferent, natural selection culls and biases life chances with the unintended result that evolution (defined today as the change in gene frequencies over time) takes place. This mindless and "worse than morally indifferent" process geared to the maximization of short-sighted selfishness is what we mean by natural selection. She is the old lady with bad habits, the "Mother Nature" [the title of the book from which this excerpt comes].

Every environment, said Darwin, confronts organisms with challenges to their survival, whether the problem is cold or heat, tropical damp or drought, famine, predators, or limited space. For mothers, these problems become obstacles to keeping their infants alive. Individuals that are best adapted to their current environment survive and reproduce, passing on the attributes they possess to future generations. Losers in the struggle to survive die before they have a chance to breed, or they produce few offspring. Eventually, their line dies out.

The unfortunate and much misused expression "survival of the fittest" to paraphrase this phenomenon was introduced not by Darwin but by his prolific and widely read contemporary, the social philosopher Herbert Spencer. To Spencer, survival of the fittest meant "survival of the best and most deserving."

Indeed, Spencer's popularity was due to the simple take-home message delivered to his privileged audience in Victorian England and America: the advantages you enjoy are well deserved. For him, evolution meant progress. The flaw in Spencer's reasoning was to mistakenly assume that environments stay the same, unchanging backgrounds

Liberal and progressive, the artist Daumier was nevertheless ambivalent about working mothers, hence his lithograph "The mother is in the heat of writing. The child is in the bath water!" From "Liberated Women: The Lithographs by Honoré Daumier."

against which "superior," optimally adapted individuals rise to the top and stay there in perpetuity. What Spencer left out were the fluctuating contingencies of an ever-changing world.

Only colored by that oversight could Spencer's social Darwinism provide a blanket endorsement of the status quo. By contrast, *Darwinism*—real Darwinian thought, correctly interpreted—ascribes no special place to anyone. No adaptation continues to be selected for outside the circumstances that happen to favor it.

When Darwin adopted Spencer's phrase "survival of the fittest," he meant the survival of those best suited to their current circumstances, not the survival of the best in any absolute sense. To Darwin, fitness meant the ability to reproduce offspring that would, themselves, mate and reproduce. But no matter. Spencer and his followers were gratified that so celebrated a naturalist and experimentalist as Darwin would cite his views, accept his catchy phrase, and endorse heartfelt convictions about essential differences between males and females that derived from Spencer's theory of a physiological division of labor by sex.

The supreme function of women, Spencer believed, was childbearing, and toward that great eugenic end women should be beautiful so as to keep the species physically up to snuff. Because mammalian females are the ones that ovulate, gestate, bear young, and lactate (this much is irrefutable), Spencer assumed that the diversion of so much energy into reproduction had inevitably to lead to "an earlier arrest of individual evolution in women than in men"—a far more dubious extension (Spencer 1873: 32). Not only were men and women different, but Spencer's females were mired in maternity.

For Spencer, this physiological division of labor by sex meant that men produce, women merely reproduce. Costs of reproduction constrained mental development in women and imposed narrow bounds on how much any one female could vary from another in terms of intellect. Since variation between individuals is essential for natural selection to take place (which is true), Spencer reasoned (wrongly) that there was too little variation among females for proper selection to occur, precluding the evolution in women of higher "intellectual and emotional" faculties, which are the "latest products of human evolution."

Spencer was aware that a woman might occasionally possess a capacity for abstract reasoning. The only such female he personally knew, however, was Mary Ann Evans (the novelist George Eliot), whom he regarded as "the most admirable woman, mentally, I ever met." But Spencer regarded her gifts as a freak of nature, attributable to that trace of "masculinity" that characterized her powerful intellect (Spencer vol. 1: 395; Paxton 1991: 17-18).

The assumption that education would be wasted on women was, of course, a self-fulfilling prophecy. Denied higher education and opportunities to enter fields like science, how could women *not* fail to excel in them? Eliot herself was one of a minuscule number of women in Europe at that time educated (in her case, largely self-educated) in languages, literature, philosophy, and natural science. By regarding her as a masculinized exception, Spencer could reconcile his recognition of this woman's talents with his internalized evolutionary scale, on which women hovered in a fecund, biologically predestined limbo somewhere between Victorian gentlemen, on the one hand, and children and savages, on the other (Paxton 1991: 118; Russett 1989: 12ff.).

Women as Breeding Machines

Spencer's validation of the status quo had far broader popular and political appeal than Darwin's more nihilistic perspective ever could. This is one reason why social Darwinism would become so influential. The second, related, reason was that Spencer's theory of the physiological division of labor by sex provided a scientific-sounding rationale for assuming male intellectual and social superiority. Spencer's "scientific" theories were an urgently needed antidote to the rising tide of feminist sentiment—especially in the United States—at a time when women were making real headway in their efforts to obtain the rights to vote and to own property in their own name.

Even before Freud declared that sex is destiny, Spencer and other evolutionists were constructing a complex theoretical edifice based on that assumption. They took for granted that being female forestalled women from evolving "the power of abstract reasoning and that most abstract of emotions, the sentiment of justice." Predestined to be mothers, women were born to be passive and noncompetitive, intuitive rather than logical. Misinterpretations of the evidence regarding women's intelligence were cleared up early in the twentieth century. More basic difficulties having to do with this overly narrow definition of female nature were incorporated into Darwinism proper and linger to the present day (Spencer 1873:32).

"The One Animal in All Creation About Which Man Knows the Least"

Spencer was not the only early evolutionist to wear blinders where women were concerned. Guided by a theory of unusual scope and power, Charles Darwin exhibited an uncanny knack for winnowing out kernels of accurate observation from the hodgepodge of anecdotes being sent him by a vast array of hobbyists, pigeon breeders, and sea captains from around the world. Yet he could not shake the biases of a man who had, after all, grown up in a patriarchal world where the most important thing a woman ever did was choose, or be chosen by, a man of means. It did not occur to his Victorian imagination—as it would immediately have occurred to a !Kung forager—just how resourceful and strategic a woman would have to be to keep children alive and survive herself.

Compared with his observations on barnacles, orchids, coral reefs, and even the expression of emotion in his own children, Darwin's observation of women and other female primates, in particular, were at best cursory. Thus in a passage few evolutionary biologists like to recall, and few feminists can bring themselves to forget, did the ever-careful Darwin deliver himself of the opinion that: "whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands, [man will attain] a higher eminence . . . than can woman" (Darwin 1882: 587). Like Spencer, Darwin convinced himself that because females were especially equipped to nurture, males excelled at everything else. No wonder women turned away from biology.

For a handful of nineteenth-century women intellectuals, however, evolutionary theory was just too important to ignore. Instead of turning away, they stepped forward to tap Darwin and Spencer on the shoulder to express their support for this revolutionary view of human nature, and also to politely remind them that they had left out half the species.

In 1875, four years after Darwin's *The Descent of Man* and *Selection in Relation to Sex* appeared, there came a polite, almost diffident, rejoinder from the American feminist Antoinette Brown Blackwell. "When, therefore, Mr. Spencer argues that women are inferior to men because their development must be earlier arrested by reproduction," she wrote in *The Sexes Throughout Nature*, "and Mr. Darwin claims that males have evolved muscle and brains much superior to females, and entailed their pre-eminent qualities chiefly on their male descendants, these conclusions need not be accepted without question, even by their own school of evolutionists" (Blackwell 1875: 13-14).

Unquestionably, the most brilliantly subversive of these nineteenth-century distaff Darwinians was Clemence Royer, Darwin's petite, blue-eyed French translator. Self-educated like Eliot, Royer was the first woman in France to be elected to a scientific society. Darwin initially admired her as the "oddest and cleverest woman in France" but by the third edition of the *Origin* had lost patience with what he regarded as Royer's presumptuous manner. It particularly irritated Darwin that she criticized his (erroneous) ideas about "pangenesis," Darwin's notion of how maternal and paternal attributes were blended in their offspring. Darwin instructed his publishers to find another translator (a man, who did not do nearly so good a job), essentially firing her. Ultimately, what most unnerved Royer's fellow evolutionists would have been her outspoken views on the "weakening of maternal instinct" in the human species and tactics

women use to subvert patriarchal control of their lives (Harvey 1997: 193-203). In France at this time the decline in birthrate, or "demographic transition," that occurred in industrialized countries from the nineteenth century onward was well under way. Frenchmen were both puzzled and deeply concerned. There were plenty of married women of breeding age, many with more than sufficient resources for a family, some even wealthy, yet the censuses continued to register a declining population. Plenty of food, yet little in the way of "brats."

Not in the least puzzled, Royer scoffed at her male colleagues' lack of imagination: "Woman ... is the one animal in all creation about which man knows the least.... a foreign species." When a male scientist describes women, she cautioned, he either extrapolates from his own experience or, worse, engages in an exercise in wishful thinking. Women were simply disguising from men their conscious desire to have few children. Large numbers of women, she believed, were deliberately curtailing conception—an idea that did not at all fit current evolutionary stereotypes about mothers.

Within the French scientific establishment of that time, Royer was doubly subversive—Darwinian in Lamarck's homeland and a maverick female with iconoclastic ideas about motherhood. No other evolutionist in the world, much less a woman, was writing about women who learn to be "mistresses so they do not have to be mothers," or wrote so enthusiastically about new techniques emanating from America for aborting unwanted pregnancies, taking advantage of physicians who have learned to "skillfully kill off the fruit without injuring the tree" (Harvey 1987: 161).

Royer's own book on the origin of man (*Originé de l'homme et des societes*) appeared in 1870. But her most interesting ideas were set down in a later manuscript explaining why maternal instincts were weakened in the human species. Entitled "Sur la natalite" (On birth), it was already in proof for an 1875 edition of the bulletin of the *Societe d' Anthropologie de Paris* when the journal's editors suppressed its publication. In that suppressed manuscript Royer wrote:

> Up until now, science, like law, has been exclusively made by men and has considered woman too often an absolutely passive being, without instincts, passions, or her own interests; a purely plastic material that without resistance can take whatever form one wishes to give it; a living creature with out personal conscience, without will, without inner resources to react against her instincts, her hereditary passions, or finally against the education that she receives and against the discipline to which she submits following law, customs, and public opinion.
>
> Woman, however, is not made like this (Harvey 1997: 194).

Caricature of Clemence Royer from Vol. 4, No. 170 of "Les Hommes d'aujourd'hui," 1881. A colleague at the Societé d' Anthropologie de Paris referred to her as "almost a man of genius." By permission of the Houghton Library, Harvard University (61-727F).

Royer assumed females were active strategists with agendas of their own. A hundred years later (in 1981), unaware of Royer's existence, I would publish a book, *The Woman That Never Evolved*, that made similar points. By then, the intellectual climate had changed. Much more empirical evidence about females was available, so a stronger case could be made. Evolutionary biology did eventually respond to these criticisms, yet in their lifetimes, the effect that these early Darwinian feminists—Eliot, Blackwell, Royer, and a few others—had on mainstream evolutionary theory can be summed up with one phrase: the road not taken. The toll was a costly one.

(continued on next page)

More than a century would elapse before Darwinians began to incorporate the full range of selection pressures on females into evolutionary analyses and in doing so recognize the extent to which males and females had coevolved, each sex responding to stratagems and attributes of the other. It took far longer than it should have to correct old biases, for evolutionists to recognize just how much one mother could vary from another, and to take note of the importance of maternal effects and context-specific development.

An unfortunate by-product of the delay in correcting long-standing biases in evolutionary theory was that by the last quarter of the twentieth century, when evolutionary paradigms were widened to include both sexes, many women, especially feminists, had already long since abandoned evolutionary approaches as hopelessly biased. Biology itself came to be viewed by women as a field sown with mines, best avoided altogether.

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TEACHING HUMAN EVOLUTION: WEBSITES

National Science Teacher's Association
(position on the teaching of evolution)
http://www.nsta.org/about/positions/evolution.aspx
(resources for teaching evolution)
http://www.nsta.org/publications/evolution.aspx

PBS
(website on evolution)
http://www.pbs.org/wgbh/evolution/
(specifically for teachers, on teaching evolution)
http://www.pbs.org/wgbh/evolution/educators/course/session5/index.html

TalkOrigins (exploring the creation/evolution controversy)
http://www.talkorigins.org/

UC Berkeley's Understanding Evolution
http://evolution.berkeley.edu/

National Center for Science Education
http://www.natcenscied.org/

National Academies (evolution resources – free downloads)
http://nationalacademies.org/evolution/

Museum of Science (human evolution resources for educators and a list of links)
http://www.mos.org/evolution/resources/

Institute of Human Origins
www.becominghuman.org

McGill's Evolution Education Research Centre
http://www.mcgill.ca/researchoffice/units/#EVOLUTION

Evolution and the Nature of Science Institutes
(Indiana University)
http://www.indiana.edu/~ensiweb/

Exploratorium Case Study in Human Origins
http://www.exploratorium.edu/evidence/

Briana Pobiner, Outreach and Education Program Specialist, Human Origins Program, National Museum of Natural History.

OBAMA AND ANTHROPOLOGY:
Anthropology in an Increasingly Global World

by James Peacock

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[Editors' Note: In 1997 the *AnthroNotes* editors invited James Peacock, then President of the American Anthropological Association, to contribute the lead article for *AnthroNotes*' 20th Anniversary Issue. The article, "Anthropology and the Issues of our Day," appeared Spring 1998. In anticipation of *AnthroNotes*' 30th anniversary, we returned to Professor Peacock and asked if he would once again give us his observations on anthropology in this time of such enormous change— in anthropology, society and our world.]

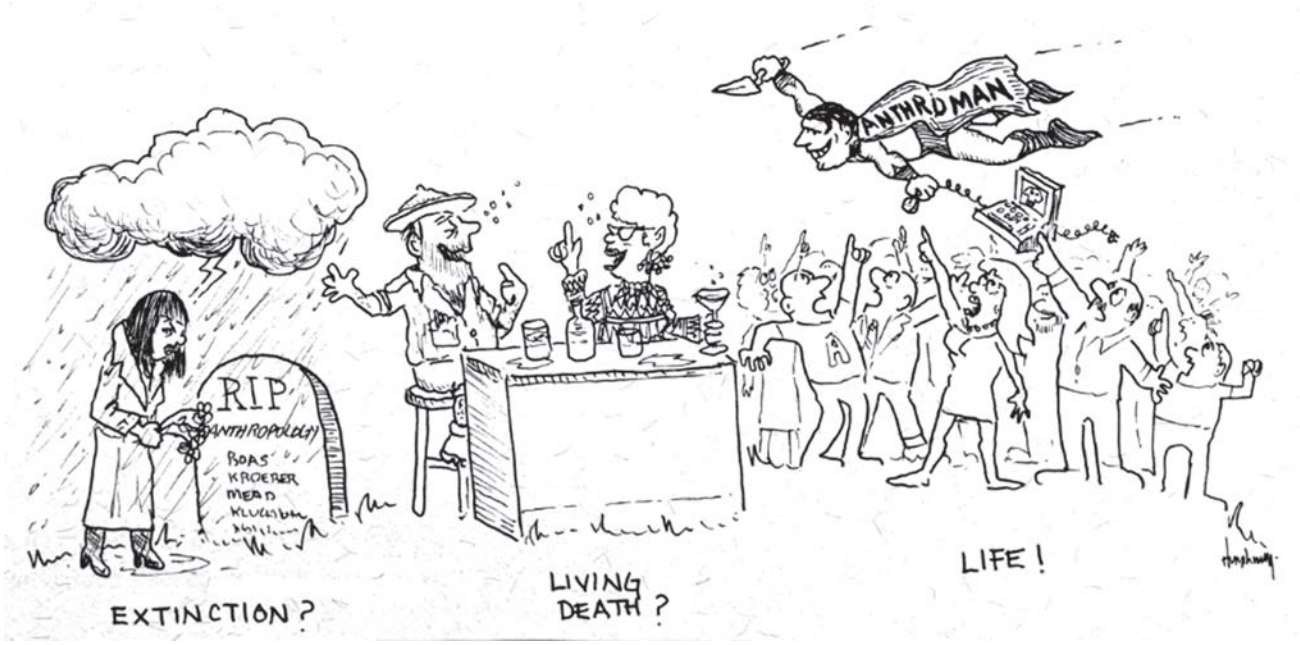
A decade ago, I wrote an essay for *AnthroNotes* based on a speech I had given as then-president of the American Anthropological Association. Now I am invited to reflect on that essay in light of the current time. I will briefly revisit that essay, recount some activities I and other anthropologists have been doing that follow up on the admonitions I offered in that first essay, and finally conclude with some of the challenges and opportunities that face us in the era of Obama.

The Nineties: "Public or Perish"

This slogan, which I appropriated from museum anthropologists, summarizes the message of my speech that I gave to my fellow anthropologists in 1997. I called for anthropologists to address more effectively issues of the wider society, that is, the public. *AnthroNotes* cleverly summarized my message of three possible futures for anthropology with a cartoon by the late Robert Humphrey showing "Anthro-man," flying like Superman to rescue society. The speech/essay helped stimulate the creation of a subfield sometimes termed "public anthropology." A website and book series edited by Rob Borofsky, as well as a program in "public interest anthropology" led by Peggy Sanday at the University of Pennsylvania, exemplify this direction. Coincidentally, this was the Clinton era—a time of prosperity in the USA and the rise of globalization.

Early 21st Century: Efforts to Walk the Walk and Talk the Talk

Following my call to "go public," I found an opportunity to act in my own locale. Back in 1993, the University of North Carolina (UNC) had celebrated its bicentennial. UNC was the first state university and Bill Clinton spoke at its bicentennial, signifying its movement from a state and regional to a national focus. However, UNC was not very global in its identity at that time, even though it had wel-



comed its first international student (from Japan) in 1893. However, in 1993 Craig Calhoun, now President of the Social Science Research Council (SSRC), had created a University Center for International Studies (UCIS), which I directed from 1996 to 2003. Fortunately, this small center, which received little funding from the University, became an engine to internationalize the university, state, and even region while reaching out globally. (These regional/global efforts are recounted in my book, *Grounded Globalism*.)

I defined nine steps to internationalize UNC, including three key ones: defining international work as a top priority and identity of the institution, appointing a central administration official to support this work, and building a space in which to work. During my seven years as director, our center accomplished all nine steps. Both the sixteen-campus system and the Chapel Hill campus agreed on international work as one of six priorities, an Associate Provost for international affairs was appointed, and an 82,000 square foot building was erected (financed by a state-wide bond) to accommodate rapidly growing activities, which were then housed in nooks and crannies. Following is a brief description of one activity: World View.

World View Program

World View (www.unc.edu/world) was established ten years ago by lawyer Robert Phay to help schools and colleges prepare students to succeed in an interconnected world. The Program's mission is to help educators internationalize schools and integrate a global perspective into every subject area of the curriculum and at every grade level, helping educators respond to rapid ethnic and cultural changes and promoting foreign language training and international travel. Phay remains director while I chair the board. During these years we have worked with almost 13,000 K-12 and community college teachers and administrators in 95 of North Carolina's 100 counties. Our main work, however, is conducting workshops with teachers and administrators of K-12 schools and community colleges. These culminate in action-plans that help guide the numerous school and college programs throughout the state.

World View exemplifies a kind of work that educators, including some (but not nearly enough) anthropologists, have been doing in the past decade. These globally-oriented educational activities have flourished in response to the rise of global forces, positive and negative, and the need to address them in K-12 education. It is important that this work continue and evolve—a challenge—given current economic pressures that, among other things, lead legislators and K-12 administrators to cut out "non-essentials."

Courageous and wise legislators and administrators see, however, that global education is increasingly important as our own society grows increasingly global. For this reason, our state legislature has provided an appropriation for World View, enabling school administrators and teachers to attend our workshops. Unfortunately academic departments, including anthropology, have not been particularly interested in or supportive of such "outreach" activity. This reflects the academic reward system that primarily rewards research—an artifact of the graduate school/research model imported from Germany in the late nineteenth century that is gradually shifting, perhaps, to a twenty-first century synergy between research, teaching, and "engagement" or application.

What is the relation of these activities to public anthropology? The work of World View certainly connects to public issues, whether those include the impact of immigration on schools (our state has one of our country's highest percentage of increase of Latino immigrants)or the need to grasp global issues as part of education. Anthropology is one of many disciplines involved; in this effort, a broad interdisciplinary paradigm has proven more effective than any single discipline, but certainly anthropological concepts are pertinent.

Looking Toward the Obama Era

Unfortunately, as we anticipate the inauguration of a new President, our era looms as one of a terrible mess threatening awful suffering by many while also promising a vision for a new world led by a visionary. Wall Street is destroying main street and vast lands beyond by irresponsible practices reflected in the illusory profits rewarded by excessive bonuses. The USA and global economies are spinning down and out of control. Nations—from Zimbabwe to the Congo—are destroying themselves by tyranny and violence. Iraq is only one of an estimated forty conflict zones. Famine and obesity vie with AIDS and stroke as killers of epidemic proportions.

Calmly poised as a visionary New Deal rescuer is Barack Obama. Prior to his inauguration he has already appointed his cabinet—working deliberately but very quickly to bring on board highly capable, largely centrist

experts—in economics, health care, labor, environment, and international affairs. Not surprisingly, these cabinet appointees come from fields outside anthropology; several are, however, distinguished academics—in economics, physics, and biology, for example. Obama himself is presumably influenced in some way by anthropology inasmuch as his mother was an anthropologist, working on microcredit organizations in Indonesia and elsewhere. Certainly, he is influenced by his global experience, living in Indonesia while attending elementary school. However, his training is in law and his experience is in U.S. government and politics.

Should anthropology shape the Obama administration in any way, that shaping must come from outside the central government—trickle up, so to speak, from the grass roots/communities/academies/schools where we do our work. What situation might we as anthropologists address? Our forte, traditionally, has been a holistic view and perspective. If we take a holistic look at our society's situation right now, what do we see?

Quantitative over Qualitative

The importance of the quantitative over the qualitative (i.e. the quality of life) is one pervasive theme today. We cannot, of course, ignore or negate numbers: population growth, destruction of rain forests, immigration demographics, and economic downturns—all important indices. However, we must go beyond measurements and try to put them together with other evidence in order to take a more holistic picture. Anthropologists tend to favor and see balances and systematic interplay among economics, politics, religion, and social forces. Our writings and research plot interrelations among such forces as fundamentalism and terrorism; relations to poverty, diversity, oppression; and the complex connections to environment, ecology, and identity (as in gender identity and sexual orientation, among many which also include regional, ethnic, class, and religious or political identities, all grounded in broader social and cultural contexts (Peacock 2007a.). The general lesson of seeing how pieces fit together in a way missed by specialists is pertinent when imagining how anthropologists might contribute understanding of broader contours of the USA and world societies.

Turning to specific issues and the ways to address them, consider the specialties represented in the more than thirty sections of the American Anthropological Association. Human rights, environment, gender, diversity, economics, law, politics, culture, psychology, education, biology, archaeology are among the specialty groups in AAA, and many of these have applied and activist as well as academic foci. The human rights committee, for example, directly treats human rights issues that arise as part of the work of anthropologists, and anthropologists work in every corner of the world at grass roots and community levels hardly visible to UN officials or others who associate primarily with heads of state and official bodies.

What we know and what we do are crucially relevant to policies and practices up and down the hierarchies of the state department. Similarly, the AAA committee on relations between anthropology and the military or intelligence communities is in dialogue with anthropologists actually working with such communities.

Another example of where anthropology might prove helpful is Obama's proposal to convene Muslims of the world to discuss terrorism and other issues. Lambasted by some Islamic scholars as artificially separating Muslims from everyone else, such a proposal can usefully be evaluated by anthropologists of religion (another section of AAA) who are accustomed to seeing religion in context. Beyond AAA, thousands of anthropologists do applied work within the contexts of many institutions and organizations, for example, the Society of Applied Anthropology; WAPA, the Washington Association of Practicing Anthropologists; and the Center for Integrating Research and Action, an effort at UNC to coordinate aca-

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demics and communities in such projects as nutrition. I believe that much of this work can inform efforts at reshaping our society in the age of Obama.

Let us all draw on anthropology together with other wisdoms to enrich the work of this era. We can do this in our teaching, in our communities, and perhaps, by "trickle up" means, helping to shape the policies and practices of our government and the wider society.

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FORTHCOMING NMNH EXHIBITS

SINCE DARWIN

The year 2009 marks a significant anniversary for the natural sciences – 200 years since Charles Darwin's birth (February 12, 1809) and 150 years since the publication of his book, *On the Origins of Species*. To commemorate these two events, the National Museum of Natural History is planning a Darwin exhibit and scientific symposium in September 2009. The Darwin exhibit will focus on Darwin's research and the significant role it continues to play in the natural sciences – including the research conducted at the National Museum of Natural History, whose collections and ongoing research continue to support Darwin's findings and expand upon his theory.

Each of the museum's research departments (Anthropology, Botany, Entomology, Invertebrate Zoology, Mineral Sciences, Paleobiology, Vertebrate Zoology) will illustrate with provocative stories and with a variety of museum specimens the impact of Darwin's evolutionary theory on their discipline and explore what has happened in the field of biological science since Darwin. The exhibit also will explore the next possible great shifts in scientific thinking.

In conjunction with the museum's exhibit, the Smithsonian Institution Libraries will exhibit a sampling of Darwin's journals, correspondence, and zoological studies on board the Beagle as well as Darwin as a geologist. Available now is the National Museum of Natural History's *Evolution Trail* that explores the current exhibits to discover how environmental changes, natural selection, extinction, and other factors play a part in the ongoing process of evolution. Why are dinosaurs extinct? Why do giraffes have long necks? Why do flowers come in many colors? Visitors follow Iggy the Iguana on the *Evolution Trail* to find the answers to these and other questions.

An exhibit, *Orchids Through Darwin's Eyes,* (January 24 - April 26, 2009) showcases the Smithsonian's extensive living orchid collection and how Darwin saw the world of orchids. (http://www.mnh.si.edu/exhibits).

WRITTEN IN BONE

Written in Bone: Forensic Files of the 17th-Century Chesapeake opens February 7 and will be on exhibit at the National Museum of Natural History through February 6, 2011. This exhibition will examine history through 17th-century bone biographies, including those of colonists teetering on the edge of survival at Jamestown, Virginia, and those of wealthy and well-established individuals of St. Mary's City, Maryland. Not until this time in our history have we had the technological capability to help us tell this tale. Human anatomy and forensic investigation provide intriguing information on people and events of America's past. The research behind this exhibit was the focus of the Spring 2007 *AnthroNotes* article, "Written in Bone: Reading the Remains of the 17th Century," by Kari Bruwelheide and Douglas Owsley, curators of the exhibit (http://anthropology.si.edu/outreach/anthnote/anthronotes.html)

Volunteers are needed to help visitors unravel the mysteries of 17th Century Chesapeake settlers from sites such as St. Mary's City and Jamestown, using the stories of the bones found there. Volunteers will learn first-hand from the curators in-depth information about the exhibition and the forensic, archaeological, and historical research that led to its creation and share that information with museum visitors. Volunteers must be at least 18 years of age, able to commit 4 hours every other week, and attend orientation and training sessions with curators and museum educators in January. For an application, go to http://www.mnh.si.edu/education/volunteering_internships/volunteers.html

Skull of the boy from James Fort, which will be on exhibit, showing a large area of missing bone in the front of the jaw. This hole was formed in life as a result of a cracked tooth, which allowed bacteria to enter the pulp chamber, resulting in a deep bone infection.

NEH SUMMER INSTITUTE FOR K-12 TEACHERS

Daily Life in Ancient Times
July 1- July 24
Andrews University, Berrien Springs, Michigan
Stipends ($3,200) available for 30 K-12 teachers
Directors: Rhonda Root and Gloria London
http://home.earthlink.net/~galondon//NEH2009
The NEH Summer Institute promotes links among school teachers, archaeological research, and the cultures of the ancient Near East by bringing together archaeologists from North America to present the latest findings and thoughts on issues critical for understanding the history, geography, and religions of the Middle East. Hands-on activities will allow teachers to touch the past while contemplating how to bring history alive for students of the future.

NEW TEACHING ACTIVITY ON EVOLUTION

"Human Evolution from Darwin to Dover: What a Long Strange Trip It's Been" is a new teaching activity available at http://anthropology.si.edu/outreach/Teaching_Activities/index.htm. Produced by Louise S. Mead, education project director for the National Council for Science Education in Berkeley, California, this activity introduces students to primate (incl. humans) classification and systematics.

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