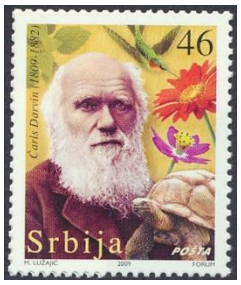
DARWIN THE BOTANIST

Patrick Mauney, BU1810



Charles Darwin
Serbia Sc#479

Of the twenty-something books written by Charles Darwin, a third or so were devoted exclusively to plants, with such titles as: *The Various Contrivances by Which Orchids are Fertilized by Insects*, *The Movement and Habits of Climbing Plants*, *The Effects of Cross and Self Fertilization in the Vegetable Kingdom*, *Insectivorous Plants*, and others. Yet Darwin, in writing to his close friend and collaborator Joseph Hooker, on more than one occasion called himself a "botanical ignoramus." All botanists should be such ignoramuses!

This survey traces Darwin's awakening interest in plants as a university student, the botanical collections he made during the voyage of the *HMS Beagle*, and his researches after he returned to England. Stamps from around the globe illustrate plants he encountered.

For a general overview and chronology of the subject, I used Mea Allan's *Darwin and His Flowers: The Key to Natural Selection* (New York, Taplinger, 1977). I often use Darwin's own words to describe the plant or scene, drawing from his autobiography, his journals and books, and his extensive correspondence, all of which are easily available through the British websites *Darwin Online* and the *Darwin Correspondence Project*. (For this reason, I have not burdened the essay with footnotes. Those interested can use the search engines of these websites, or simply Google a phrase or two to find the source of the quotation.)

In his autobiography, Darwin relates how as a boy he tried to make out the names of plants. He became an avid collector of insects, rocks, and shells, but it was only in university, under the tutelage of his mentor and lifelong friend, the botanist John Stevens Henslow, that he turned his attention systematically to the plant world. He began investigating pollen grains, such as from the common green-winged orchid, *Anacamptis morio* (=*Orchis m.*).

A. morio
Yugoslavia Sc#476

One day he rushed off to Henslow to share what seemed to him to be a new discovery about orchid pollen, only to learn, very gently, that it was commonplace. Rather than be discouraged, however, the young Darwin became as enthusiastic about plants as he was about geology and beetles. Much later he would write a book on orchids, a source of endless fascination to him.

Voyage of the Beagle

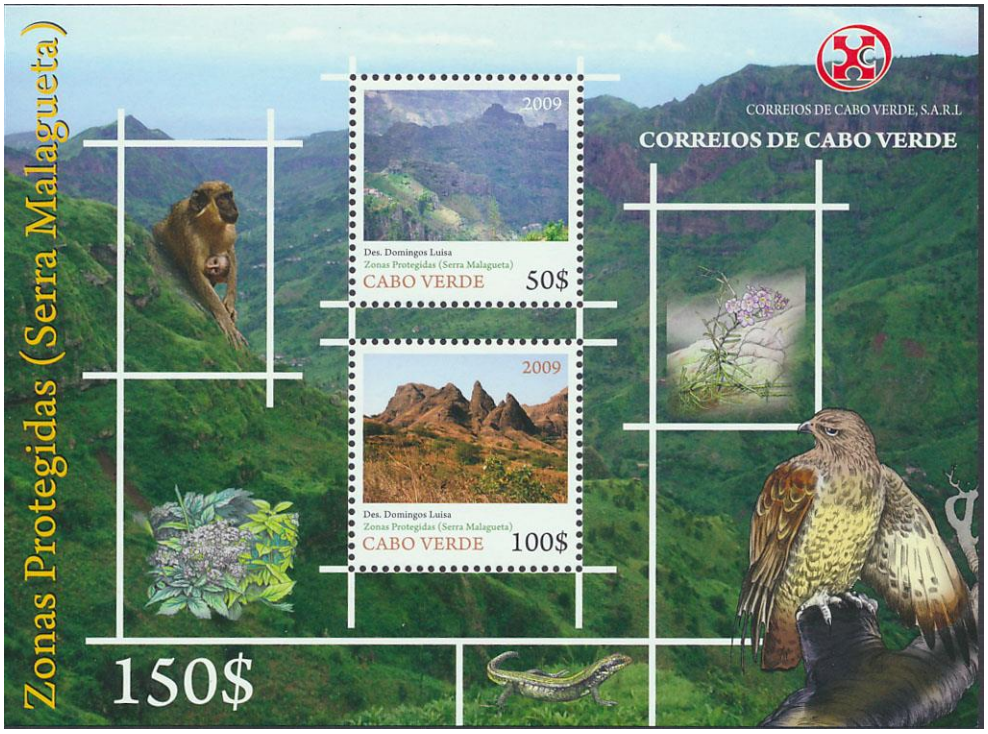
HMS Beagle
Uruguay Sc#2268b

Having given up on medicine as a career (he could not abide the blood) and clueless as to his future, the twenty-two year-old Darwin, almost by chance, was chosen by Captain Robert FitzRoy to accompany him as "gentleman-naturalist" aboard *HMS Beagle*, set to circumnavigate the globe on a surveying mission. Underway just after Christmas 1831, the mission was to last nearly five years.

Among the few possessions he took aboard the tiny ship was Alexander von Humboldt's *Personal Narrative* of his years in South America. While completing his studies at Cambridge, Darwin had written his sister, "All the while I am writing now my head is running about the Tropics; in the morning I go and gaze at Palm trees in the hot-house and come home and read von Humboldt: my enthusiasm is so great that I can hardly sit still on my chair." He burned to see the great Dragon Tree (*Dracaena draco*) of the Canary Islands, described so vividly by von Humboldt.

D. draco
Spain Sc#1751

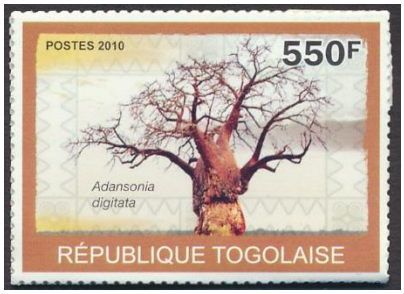
But the *Beagle* could not send her crew ashore in the Canaries, owing to quarantine, so it was in Cape Verde that Darwin would first see the glories of tropical vegetation.



Cape Verde Landscapes
Cape Verde Islands Sc#926

Darwin, drunk on the landscape, exulted in his journal, "It has been for me a glorious day, like giving to a blind man eyes—he is overwhelmed with what he sees & cannot justly comprehend it."

By some luck he found in Cape Verde the famed baobab tree (*Adansonia digitata*) and collected odd fruits like the Bladder Cherry (*Physalis alkekengi*) and the shrub *Caesalpinia pulcherrima*.



A. digitata
Togo Mi#3395

P. alkekengi
Korea Sc#1716

C. pulcherrima
Maldives Sc#461

Brazil would dazzle even more. In Bahia, after a seasick crossing, Darwin found himself in the *mata atlântica*, the great coastal forest extending the length of Brazil's eastern seaboard.

Atlantic Forest
Brazil Sc#2338

"The day has passed delightfully," Darwin wrote in his journal. "Delight itself, however, is a weak term to express the feelings of a naturalist who, for the first time, has wandered by himself in a Brazilian forest….It is hard to say what set of objects is most striking; the general luxuriance of the vegetation…, the elegance of the grasses, the novelty of the parasitical plants, the beauty of the flowers, the glossy green of the foliage."

The Beagle was to spend more than two years on the eastern seaboard of South America, traversing the coast from north to south, then back and forth again several times. Most of that time Darwin spent ashore, observing, collecting, and greatly enjoying himself.

Pampas Scene
Brazil Sc#2355

The lush forests of Brazil did not extend to more southern reaches. The landscape of southern Brazil, Uruguay, and much of Argentina east of the Andes was pampas, where grasses and low shrubs predominated and trees were rare. The *Beagle* had first deposited Darwin ashore in early spring. Although the landscape was lackluster, he was delighted with the carpet of dwarf flowers covering the vast flat plain and filled his herbarium sheets for shipment to Henslow.

Aimé Bonpland
Argentina Sc#2483

Aimé Bonpland, the French botanist who accompanied von Humboldt on the South American expedition that so inspired the young Darwin, was living quietly in the province of Corrientes during Darwin's sojourn in Argentina. As far as we know, the two never crossed paths. What a meeting it would have been!

P. dioica
Uruguay Sc#1709

On the lonely pampas an isolated estancia would boast its *ombú* (*Phytolacca dioica*), providing comfort and shelter from sun and rain alike. Darwin must have taken shelter under the massive evergreen more than once as he rode with his gaucho companions.

Nothofagus pumilio
Argentina Sc#2256

As the *Beagle* pushed on to the far reaches of Patagonia, Tierra del Fuego, and the Falkland Islands, southern beeches (*Nothofagus* spp.) dominated the treescape.

Darwin found the trees gloomy in their dusky uniformity, but he was cheered by the tiny alpines that flourished near the snow-capped peaks of Tierra del Fuego. Among the specimens he prepared for Henslow were *Gunnera magellanica* and *Acaena magellanica*.

G. magellanica
Falkland Islands Sc#167

A. magellanica
Falkland Islands Sc#175

Darwin also added to his collection in Patagonia and the Falklands a sea cabbage (*Senecio candicans*) and the shrub *Berberis ilicifolia*. A tiny, strikingly orange-red slipper flower, *Calceolaria darwinii* (now *C. uniflora*), was eventually named for the collector.

S. candicans
Falkland Islands Sc#170

B. ilicifolia
Falkland Islands Sc#627

C. darwinii
Falkland Islands Sc#436

Darwin found the Falklands to be a bleak, forbidding, and lawless place. His interest was fired, however, by reported subtle differences in the *warrah*, or native fox, on the two main islands. What accounted for these differences? From here on, island biogeography would stir his thinking. Not only the Falkland Islands Fox, but the plants, too, presented a riddle. The Falkland Islands were dreary. Vegetation consisted almost entirely of a wiry brown grass—no moss, not a single tree. While the nearby island of Tierra del Fuego was lush. The differences were all the more striking given the similarities of climate and geological origin. Years later, in a letter to Joseph Hooker, Darwin would declare the geographical distribution of plants, "that almost keystone of the laws of creation."

J.D. Hooker
B.A.T. Sc#127

Strait of Magellan
Chile Sc#237

In June 1834, mission accomplished on the east coast, *Beagle* transited the Strait of Magellan into the Pacific to begin more than a year of surveys along the Chilean seaboard.

The ship sailed in and among the fjords and islands of Chiloé province, with its temperate rain forests and intriguing monkey-puzzle trees (*Araucaria araucana*) sacred to the native Mapuche people.

In January 2012, a researcher in London unearthed plant fossils Darwin had collected in Chiloé Province, overlooked in a museum storeroom for more than 150 years.

A. araucana
Chile Sc#873

Fossil Ferns
B.A.T. Sc#402

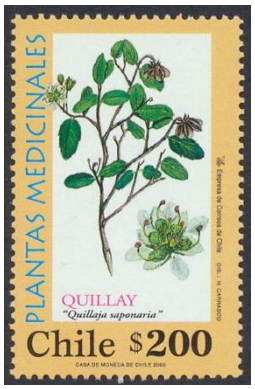
While he sometimes disparaged himself as a botanist, Darwin was more confident as a geologist. Along with von Humboldt's volume, he had brought aboard the *Beagle* the first volume of Charles Lyell's *Principles of Geology* (and would receive the second volume before the voyage ended). From Lyell, Darwin took the concept that the present is the key to the past. The steady accumulation of minute geological changes over enormous periods of time account for what we see today. This was a novel idea at the time and it deeply influenced Darwin.

He had recourse to Lyell time and again in his journeys. While ashore in Valdivia, Darwin experienced first-hand an earthquake. The city of Concepcion, just to the north, was all but destroyed. Visiting the damaged city, Darwin observed near the fishermen's docks a small bed of mussel shells, which the earthquake had lifted several meters above the sea. If this could happen in one brief temblor, he reasoned, could not the same process, given enough time, lift whole mountains?

Soon after the earthquake, Darwin crossed the cordillera to Mendoza, then back to Valparaiso. One day, he came upon an unforgettable scene, "It is an old story, but not the less wonderful, to hear of shells which were once crawling on the bottom of the sea, now standing nearly 14,000 feet above its level." Nearby, in "an escarpment of compact greenish Sandstone I found a small wood of petrified trees in a vertical position…" In an age past these stark trees had been buried and petrified, then lifted thousands of feet in a long series of earthquakes, exposed to view by wind and weather. Lyell's scheme of up thrust and elevation could not have been made plainer. "I cannot express the delight, which I felt at such a famous winding up of all my geology in S. America."

Petrified Wood
Germany Sc#2259

Returning to his base in Valparaiso, Darwin found on the lower slopes of the cordillera groves of the pale green *quillay* or soapbark tree (*Quillaja saponaria*) and the spectacular chandelier cactus (*Browningia candelaris*).



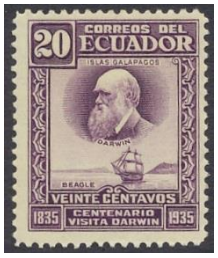
Q. saponaria
Chile Sc#1329

B. candelaris
Chile Sc#1140d

Mission accomplished on the west coast, the *Beagle* passed a few days in Peru, where Darwin made note of gentle hills outside Lima carpeted with moss and beds of a beautiful endemic yellow, lily-like flower, *Ismene amancaes* (=*Hymenocallis amancaes*).

H. amancaes
Peru Sc#852

Quitting Peru, the *Beagle* made for the equator and the Galápagos Islands, a stark volcanic archipelago claimed by Ecuador. "I am very anxious to see the [islands]," Darwin wrote his sister, "I think [they] cannot fail to be very interesting."



Darwin & *HMS Beagle*
Ecuador Sc#343

The names of Darwin and the islands are forever joined, so famous in the history of science was this five-week visit to become. It is fitting that Ecuador should have been, in 1936, the first nation to commemorate Darwin on its stamps. But the landscape was uninviting:

> *"…a broken field of black basaltic lava, thrown into the most rugged waves, and crossed by great fissures…everywhere covered by stunted, sun-burnt brushwood, which shows little signs of life. The dry and patched surface, being heated by the noonday sun, gave to the air a close and sultry feeling, like that from a stove: we fancied even that the bushes smelt unpleasantly."*

Galápagos Landscape
Ecuador Sc#L4

Nonetheless, Darwin wrote, "The natural history…is very remarkable: it seems to be a little world within itself." And while the picture that most easily comes to mind for us is that of Darwin's finches or Darwin's giant tortoises, the plant life was every bit as remarkable. As with the animals, each island, in addition to having plants in common with the other islands, had its own distinct flora. Mea Allan notes: "The proportion of 100 new flowering plants out of 175 made [the Galápagos] a distinct botanical province."

Among the endemic plants Darwin observed were: the giant cactus (*Jasminocereus thouarsii*), a lava cactus (*Brachycereus nesioticus*), the heterostylous small tree *Cordia lutea*, and *Calandrinia galapagosa*, a member of the Portulacaceae family.

J. thouarsii
Ecuador Sc#1461

B. nesioticus
Ecuador Sc#1492a

C. lutea
Ecuador Sc#1462

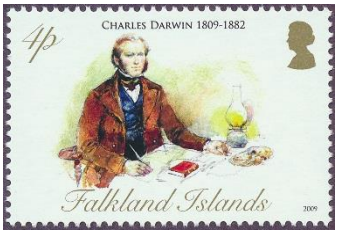
C. galapagosa
Ecuador Sc#1982c

Another curiosity was the relative scarcity of insect pollinators. For example, there was only one species of bee, which would later be named for Darwin (*Xylocopa darwinii*).

X. darwinii
Ecuador Sc#1314

Later, as the *Beagle* made her way home, Darwin ruminated in his small cabin on what he had seen of the Galapagoan fauna. His thoughts could serve also for the flora.

> *"When I recollect the fact that [from] the form of the body, shape of scales and general size, the Spaniards can at once pronounce from which island any tortoise may have been brought, when I see these islands in sight of each other and possessed of but a scanty stock of animals, tenanted by these birds, but slightly differing in structure and filling the same place in nature; I must suspect they are only varieties. The only fact of a similar kind of which I am aware, is the constant asserted difference between the wolf-like fox of East and West Falkland Islands. If there is the slightest foundation for these remarks, the zoology of archipelagoes will be well worth examining; for such facts would undermine the stability of species."*



Darwin in his cabin
Falkland Islands Sc#977

From the Galápagos, the Beagle set sail for Tahiti, which he, along with generations of mariners, found "a most charming spot." Here Darwin saw up close his first coral reef. His observations in Tahiti, and, a few months later, in the Cocos Islands, would verify the theory of coral reef formation he had first thought out in Chile.

As for the Tahitian plant life, Darwin was overwhelmed by the lush landscape and the many varieties of tropical fruits. But the islands had by then been pretty well botanized, and Darwin found little of collecting interest.

Orange Porter
Fr. Polynesia Sc#1078

He was, however, excited to be sailing in the wake of the *HMS Endeavour*, Captain Cook's ship, which carried the botanists Joseph Banks and Daniel Solander. As a boy, Charles had thrilled to the tales of their exploits.

Grapefruit
Fr. Polynesia Sc#1080

Daniel Solander
Sweden Sc#2418–19

In New Zealand, the giant endemic *kauri* (*Agathis australis*) caught his eye; he measured one at 31 feet in circumference. Tree ferns and flax (*Phormium tenax*) were common, native to the colony and nearby Norfolk Island. However, unlike Tahiti—largely because of the inhabitants—he found New Zealand to be "not a pleasant place."

A. australis
New Zealand Sc#241

P. tenax
Norfolk Is. Sc#178

Impressed with the wealth of Sydney, in the colony of New South Wales, Darwin had a decidedly mixed reaction to the state of society (every other person "somewhere between petty rogue & bloodthirsty villain").

Only a little less mixed were his thoughts on the unique flora and fauna of the colony. Reflecting on the platypus and kangaroo, the lyrebird and the emu, and the strange flora of Gondwana, Darwin reckoned the rational observer, noting the strangeness of these creatures relative to the rest of the world, would conclude, "Surely two distinct creators must have been at work."

Platypus
Australia Sc#324

Banksia
Australia Sc#977

Tasmania reminded him of Tierra del Fuego and Chiloé with its thick forests and cool temperatures. Here the towering mountain ash (*Eucalyptus regnans*) reigned as one of the tallest trees in the world, with the soft tree fern (*Dicksonia antarctica*) typically interspersed among the giants.

Eucalyptus & Tree Fern
Australia Sc#1534

Grass Tree
Australia Sc#679

Ashore at King George Sound in southwest Australia, in an arid, sparsely vegetated landscape, Darwin came across great numbers of the remarkable native grass tree (*Xanthorrhoea preissii*).

The *Beagle* quit the continent of Australia in March 1836, bound northwest for the Keeling (now Cocos) Islands, two flat, low-lying atolls and associated coral reefs. Here Darwin's theory of coral reef formation came together, in which he masterfully tied the actions of billions of tiny invertebrates to the uplift of the Andes thousands of miles away.

While coral was king beneath the surface, the coconut tree (*Cocos nucifera*) ruled above the lagoon—thus the name of this tiny territory in the Indian Ocean. The hundred or so inhabitants scratched out a living, heavily dependent on the tree with its oil and nuts.

Coconut
Cocos Islands Sc#176a

Soil was all but nonexistent; apart from the coconut there was only a handful of other small trees. Darwin understood there to be only twenty-three species of plants in the territory. He took away specimens of almost all of them, two of which had never been described before. Writing in his diary of *Pemphis acidula*, Darwin noted, "No sooner has a new reef become sufficiently elevated by the accumulation of sand upon its surface, but this plant is sure to be the first which takes possession of the soil."

P. acidula
Cocos Is. Sc#195

C. subcordata
Cocos Is. Sc#186

The Keeling teak (*Cordia subcordata* = *C. orientalis*), Darwin noted, was so named by the inhabitants "because it furnishes them with excellent timber…. A large tree, abounding in some of the islands, very leafy, with scarlet flowers; but only a few blossoms were expanded at the time, and they easily fell off."

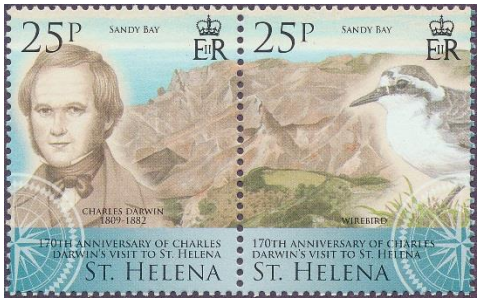
Hibiscus tiliaceus (=*Paritium tiliaceum*), another small tree, also fell into the useful category for Pacific islanders, especially important for fishermen's floats.

H. tiliaceus
Cocos Is. Sc#198

Darwin's observations on insular plant provenance would be continued years later as he pursued experiments on the viability of seeds in salt water.

From the Cocos Islands, the *Beagle* made for Mauritius, where in a very brief stop Darwin rode an elephant and found a landscape heavily cultivated, with few collecting opportunities. A call at the port of Cape Town afforded opportunity to meet one of Darwin's great heroes, Sir John Herschel, English astronomer and scion of astronomers, who was at the Royal Observatory on an extended mission. According to Richard Holmes, "Herschel's expedition to the Cape came to represent for Darwin the important ideal of the independent working scientist, which inspired the rest of his life." Recalling his undergraduate years, Darwin wrote: "Humboldt's *Personal Narrative* and Herschel's *On Natural Philosophy* stirred up in me a burning zeal to add even the most humble contribution to the noble structure of Natural Science."

Into the Atlantic at last, and a brief visit to the island of St. Helena, recently home to the unhappy exile Napoleon. Most of the plant life on the island had been introduced from Britain, the hills covered in Scots pines.



Darwin's Visit
St. Helena Sc#911

Ascension Island, the next port of call, presented a bleak landscape to the homesick sailors, now more than four and a half years into their voyage. With the end fast approaching, Darwin became anxious and unsure about his future. But a letter awaited Darwin that brought him joy, filling him with anticipation and confidence in a growing sense of vocation. Darwin learned that John Stevens Henslow had shared letters with his observations from the voyage with the leading lights in natural history. These professionals were all excited by his discoveries and eagerly anticipated his return.

> *"I received a letter whilst at Ascension, in which my sisters told me that [Professor] Sedgwick had called on my father and said that I should take a place among the leading scientific men….After reading this letter, I clambered over the mountains of Ascension with a bounding step and made the volcanic rocks resound under my geological hammer!"*

On October 2, 1836, the *Beagle* arrived in Falmouth. Darwin was off like a shot. Traveling overnight, he arrived at the family home in Shrewsbury early the next morning, five years and three days after leaving. His biographer Janet Browne reports the scene at breakfast, "Why," his father said, "the shape of his head is quite altered."

Darwin the Botanist: to be continued…