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Kilauea Eruptions and the Hawaiian Archipelago: The Geology of Plate Tectonics and Hotspots

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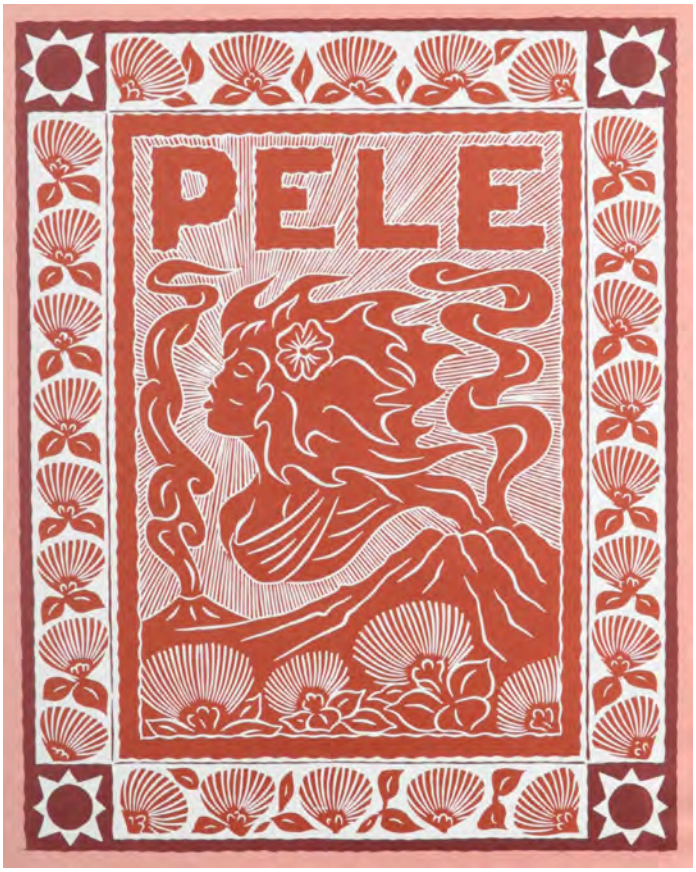
Abstract

A four-month surge of Mount Kilauea eruptions (May to August 2018) on the Big Island reminds us that the whole chain of Hawaiian islands has been built by volcanic activity. Kilauea is one of five volcanoes that built the Big Island; a future island (Lo'ihi) is growing on the seafloor 20 miles to the southeast. A plume of rising magma from deep inside the Earth's mantle underlies a seafloor hotspot; lava is forced through vents in the Earth's crust; as the Pacific seafloor moves northwest from its origin at the East Pacific Rise, this stationary hotspot creates a line of volcanic islands. To the northwest, submerged seamounts remain as remnants of former islands once formed over this hotspot. A northward chain known as the Emperor Seamounts reveals that this same hotspot has created more than 100 volcanoes over 70 million years. The Hawaiian and Emperor seamounts are not unique. The New England Seamounts off the coast of Massachusetts and similar chains in the South Atlantic record the east-west spread of the Atlantic seafloor over mid-ocean hotspots. In the Indian Ocean, north-running seamount chains record the northward movement of the Indian plate following the breakup of Pangea. In the United States, a line of extinct craters west of Yellowstone across Idaho mark the westward movement of the North American plate over the hotspot now under Yellowstone National Park.

A dramatic upsurge of volcanic activity on the Big Island of Hawaii on May 3, 2018, was reported worldwide, generally as isolated news items: a new fissure, an explosive fireworks display, lava flowing into the sea, Almost daily we saw images and photos of geological change, a visible process photographed, and shown on the TV news (Figure 1).

Figure 1. Kilauea Lava Flow. Mount Kilauea on the Big Island of Hawaii has been in quiet eruption since 1983 with limited impact on island residents. Since May 3, 2018, a dramatic upsurge of volcanic activity has affected neighborhoods and residents, forcing evacuations and sending lava flows toward the eastern coast. Photo: NPR.

Rarely did we find the Kilauea eruptions placed in the larger contexts of island building, mantle plumes, plate



Figire 2. Dietrich Varez is one of several artists who have created images of Hawaiian myth associated with ever-present volcanic activity. Here the cover of Pele: The Fire Goddess *(1991) illustrates his innovative print-paintings that accompany the story of Pele by Pua Kanaka'ole Kanahele published by the Bishop Museum Press, Honolulu.*

tectonics, the evolution of islands into atolls, and the astonishing line of northwest-running seamounts with their abrupt northward turn, now evident in the line of Emperor Seamounts running all the way to the Aleutians 3,600 miles away (See Figure 5).

Hawaiians are intensely aware of the drama of earthquakes, eruptions, and lava flows, vividly narrated in their centuries-old stories of Pele (Beckwith 1982), goddess of Hawaii's volcanoes (Figure 2).

In Hawaii, the past is resident in the present, not only in the continuing drift of the archipelago across the Pacific but also in island-building itself, including a new undersea volcano a few miles away destined to become another island in the Hawaiian chain. Big Island eruptions provide a contemporary view of geological change within the Earth chapter of the Big History narrative. Ancient mythic stories often suggest physical events we describe in scientific terms: artistically Pele's emotions of love and devotion punctuated by sudden episodes of betrayal and revenge metaphorically reenact geological periods of volcanic quietude and eruptive violence. As Big History teachers in search of vivid illustrations of geological change at work, it behooves us to take advantage of these events to articulate one of the central chapters in this epic of the Earth—one of the few Big History stories that can be brought to life in present time.

More than a century ago, the geologist James Dana visited the eight major islands of the Hawaiian Archipelago. He observed a distinct difference in their ages: the islands at the northwest end, Kaua'i and Ni'ihau, were the oldest; the others were progressively younger with the Big Island at the southeast end the youngest. In *Characteristics of Volcanoes, with Contributions of Facts and Principles from the Hawaiian Islands* (1891) Dana pointed out that as we move northwest along the island chain we find that erosion is progressively more advanced, a certain sign of increasing age. Dana was unable to provide an explanation and none was forthcoming for the next sixty years. The theory of continental drift put forth by Alfred Wegener in *The Origin of Continents and Oceans* (1915) focused primarily on the continents; presumably islands were unassimilated fragments. Moreover, Wegener's theory impressed few geologists for lack of any explanation for how huge land masses could possibly move. But observations collected during the International Geophysical Year (IGY), July 1957 to December 1958, led to a radical new geological perspective. Oceanographer Robert Dietz (1961), who worked with the Geodetic Survey during the IGY, published a theory of ocean basin evolution and sea floor spreading. His research colleague, geologist Harry Hess, who had served in the U.S. navy, was

concerned with possible seafloor obstacles that might interfere with deep submarine movement; his paper, "The History of Ocean Basins" (1962), identified mid-ocean ranges and added theoretical foundations for seafloor spreading.

From this cluster of publications, the theory of plate tectonics was born, and geologists began examining every part of the planet, including the Hawaiian Archipelago. Canadian geologist John Tuzo Wilson (1963a, 1963b) suggested that the crustal plate underlying the Pacific Ocean might be moving over a stationary source of upwelling lava that he called a "streaming point": thus, "each streaming point gives rise to a succession of volcanoes."Chris Christofferson is credited for coining the term "hotspot" for Wilson's streaming point to which Princeton geologist W. Jason Morgan (1971, 1972) added a theory of thermal plumes from deep within the Earth's mantle as an explanation for hotspots. In a single decade, a master theory of geological change was in place, providing a foundation for understanding mountain building, earthquake activity around the world, and concentrations of volcanic activity along plate margins. For our purposes, the recognition of plate movement and stationary hotspots provided an explanation for the creation of the Hawaiian Islands and, it turns out, other island and seamount chains around the world.

This may be the appropriate place to frame a justification for this essay. In surveying precursors to Big History—Preston Cloud's *Cosmos, Earth, and Man* (1978), Nigel Calder's *Timescale* (1983), Brian Swimme's and Thomas Berry's *Universe Story* (1988)—we note that Hawaii receives no attention. In subsequent Big History books—*The Structure of Big History* (1996), *Maps of Time* (2004), *Big History from the Big Bang to the Present* (2007), *A Most Improbable Journey* (Alvarez 2017), and *Origin Story* (Christian 2018)—comment on Hawaiian history is limited to migrants who populated it a few centuries ago from islands to the south. Its sole treatment to date in the context of Big History occurs within a more extended survey of tectonic plates, hot spots, and plumes by Garcia-Moreno *et al* (2017).

This 70-million-year narrative amounts to one of the most dramatic chapters in the Earth segment of the Grand Narrative. If we begin with the Big Island where rivers of lava have spread across hundreds of acres over the past few weeks, we see in miniature how the Big Island was built. Red hot lava pouring into the ocean provides a view of island building that has been going on for a million years (Figure 3).

Figure 3. Lava fountains from Kilauea's fissures flow toward the ocean, altering and extending the coastline. Lava reaching the coast leads to an explosive encounter—a battle of fire and water. Since May 2018 hundreds of acres have been added to the east coast of the Big Island. Photo: USGS.

The building of the Big Island began 600 thousand years ago with Manukona, the first of six volcanoes, which erupted for approximately 300 thousand years until plate movement led to the emergence of another volcano, Kohala, miles to the east that eventually conjoined with Manukona. This continued with subsequent volcanoes—Maunja Kea, Mauna Loa, Huadlalai, and finally Kilauea, each subsuming the earlier ones, each higher than the last, with Kilauea now towering 13,792 feet above sea level.

The result is a composite island of more than 4,000 square miles averaging 64 miles in diameter. The

exposed third conceals a vast undersea bulk of 20,000 feet elevation; topped by the island elevation, this adds up to a mountain 32,000 feet high, 3,000 higher than Mount Everest. Its shallow undersea slopes spread out to a seafloor foundation of well over 30,000 square miles. The volcanic material sufficient to build an island of such bulk challenges imagination: continuous eruption over millennia has been the rule rather than exception.

The migration of this enormous mass is part of a much larger story. The Hawaiian islands are migrating to the northwest, carried on seafloor that originated at the East Pacific Rise far to the southeast where upwelling lava pushes into the north-south boundary between two crustal slabs, slowly wedging these massive tectonic plates apart. As it rises and spreads, lava creates new seafloor.

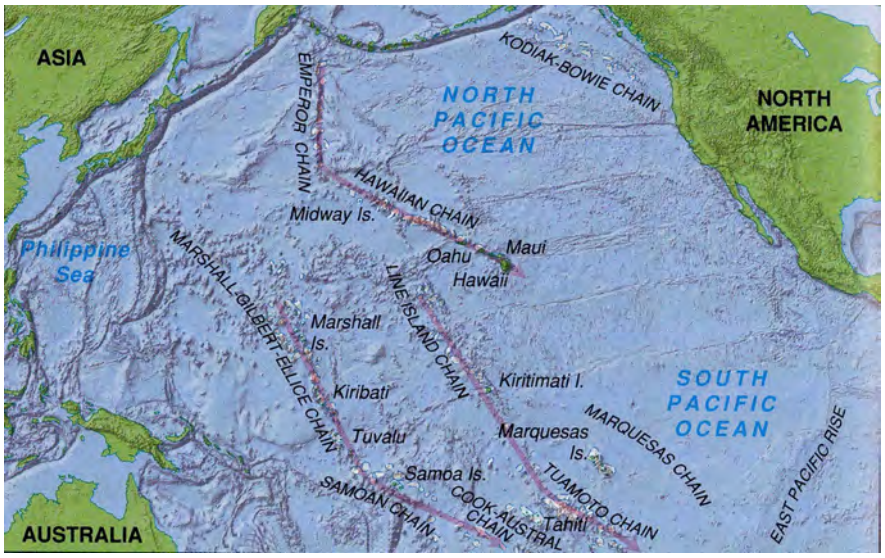


Figure 4. The East Pacific Rise (bottom right). This range of deep-ocean seamounts averaging 9,000 feet in elevation runs south from Baja California, marking a plate boundary, a crustal fracture where seafloor is being created. This spreads east into a subduction trench under South America and northwest across the Pacific. Its passage over the Kilauea hotspot has created the world's longest island-and-seamount chain. https://homesecurity.press/quotes/emperor-seamount map/

Based on ocean bottom cores and paleomagnetism, we discover that the seafloor crust is progressively older as it moves away from this crustal boundary. Under the Big Island the seafloor is approximately 80 million years old, having traveled 3,600 miles from its point of origin in the southeastern Pacific. Running south from Baja California, the East Pacific Rise marks the major mid-ocean ridge of the largest ocean on the planet (Figure 4).

From this origination fracture, the vast Pacific seafloor has emerged over the past 150 million years, riding northwest on convection currents in the underlying mantle. This ongoing movement moves it across the stationary hotspot and mantle plume that has been feeding the Hawaiian volcanoes for millions of years.

Moving northwest from the Big Island to the other seven islands spread over a distance of 350 miles, we reach the much older Ni'lhau, originally more than 4,500 feet in elevation but now eroded and subsided to less than 1,300 feet. Like the underlying ocean bottom crust, these islands are moving northwest at 3 to 4 inches per year, adding up to an age for Ni'lhau and Laua'l of 5 to 6 million years. Moving farther to the northwest another 1,100 miles, we discover ten minor islands, including Midway and Kure; the whole Hawaiian Archipelago of 18 islands stretches 1,400 miles. But between and beyond these lie numerous atolls and islands now reduced to seamounts, the whole chain adding up to 70 volcanoes created over 50 million years (Figure 5).

The generally decreasing elevation of the islands as they move northwest and their eventual subsidence below sea level is partially caused by erosion, but traces ultimately to the configuration of the Earth's mantle. Tuzo Wilson, who advanced the theory of hotspots as the origin of the Hawaiian Islands, suggested that a plume rising from the lower mantle is the probable cause. While supplying a continuing flow of lava to crustal vents, massive amounts of magma spread out like a thunderhead under the crust.

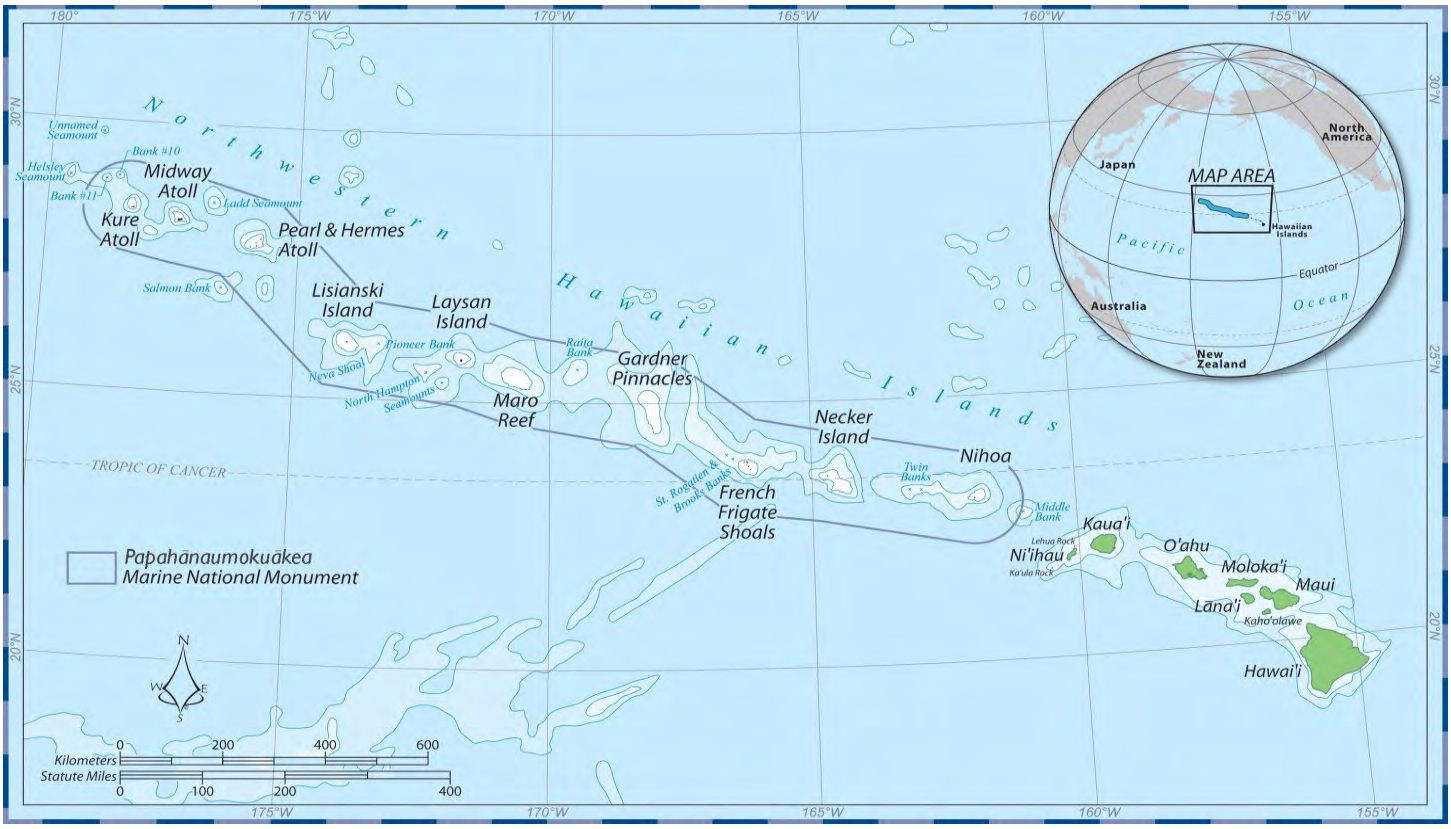


Figure 5. The Hawaiian Islands and Seamounts. The main islands can be seen at the right hand (southeast) end of the chain. As the islands move northwest, they slip below sea level, forming a 1,400- mile line of seamounts.
Illustration: https://oceanexplorer.noaa.gov/okeanos/explorations/ex1504/background/mpas/media/pmnm-hires.jpg.

Explaining the upward bulge of the island chain, Grigg (2014, 26) describes how the mantle plume has "heated, thinned, and uplifted the crust to produce a broad swell three hundred to four hundred miles wide, which itself rises four to five thousand feet above the bottom of the surrounding Pacific Ocean." This provides the mechanism for an adjacent ocean depth reduced by as much as 3,000 feet. As the moving seafloor crust, driven by convection in the mantle, approaches the hotspot it rides up this swell. As it traverses the hotspot, it reaches maximum elevation during several hundred thousand years of continuous eruption. The evidence of multiple crevices and vents around Kilauea indicates that thermal plumes rise through branching vents that may vary in the strength of eruption as the crust rides over, blocks some vents, and opens up new channels for lava flow. For two or three million years, each island rides atop this swell until, a few hundred miles to the northwest, it begins its slow slide down the elongated slope of the swell, losing approximately 3,000 feet in elevation. In most cases, this, combined with subsequent erosion of the steep mountainous landscape, results in a disappearance of the island below sea level where it remains as a submerged seamount.

At a distance of 2,000 miles from the Big Island, a striking anomaly occurs. The line of submerged seamounts abruptly changes direction. Bending to the north, it heads toward the Russian Kamchatka Peninsula where the seamounts subduct into the 34,400-foot-deep Kuril-Kamchatka continuation of the Aleutian Trench (Figure 6).

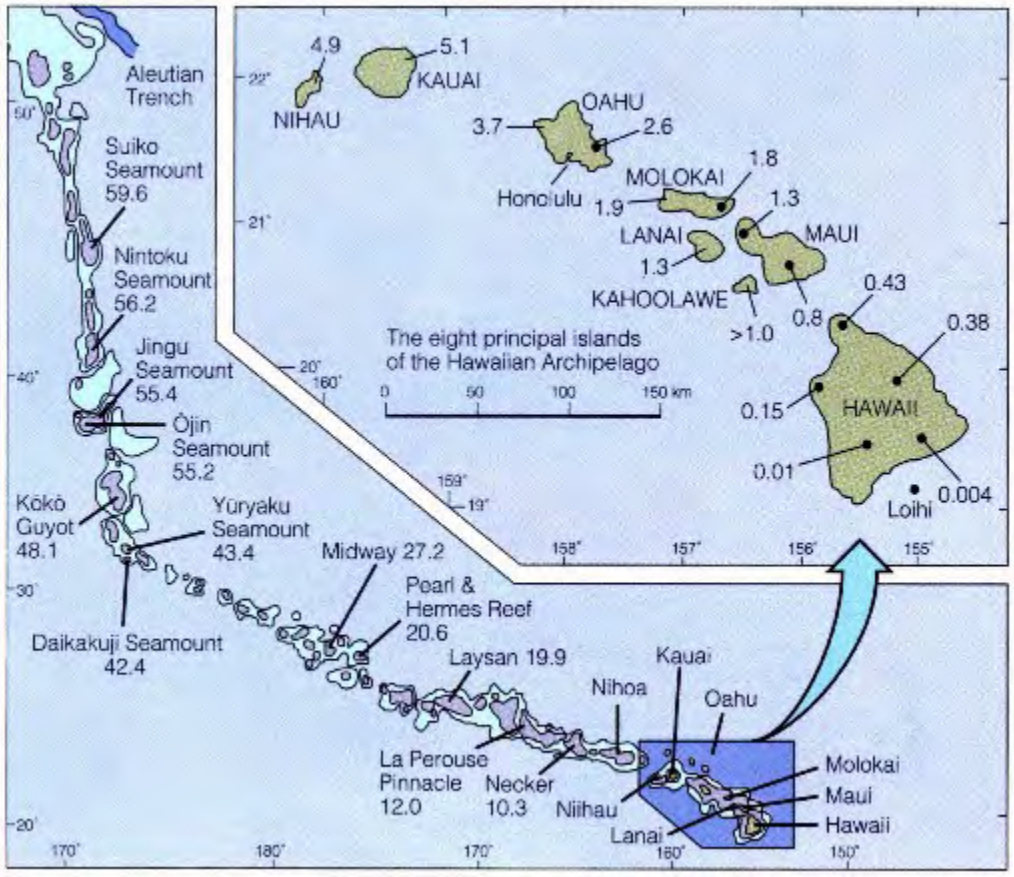


Figure 6. The Hawaiian Ridge and Emperor Seamounts. Ocean bottom mapping began during the International Geophysical Year (1957-1958). Seafloor cores established dates for the islands and seamounts. Subsequently National Geographic *published ocean-floor relief maps of the Indian (October 1967), Atlantic (June 1968), and Pacific (October 1969), combined into a world ocean-floor map (December 1981).* The Times Atlas of the World *(7th ed. 1985) began labeling undersea ridges and seamount chains on its ocean surface maps.*

The resulting north-south chain adds up to another 40 submerged islands known as the Emperor Seamounts in honor of the Japanese geologist who first identified them. Referring to the "Hawaiian-Emperor Bend" (HEB), Trond H. Torsvik *et al* (2017) contend that "the HEB cannot be explained without invoking a prominent change in the direction of Pacific plate motion around 47 Ma." Possible causes within this complicated plate tectonic framework have been explored, but the HEB has remained unexplained; a search for an explanation in adjacent plate movement (Norton 1995) was inconclusive. The Emperor Chain was created over a period of 30 million years; added to the Hawaiian chain, the whole Archipelago range of 106 volcanoes was created over a period of 70 million years.

This narrative of the Hawaiian Archipelago evolution is particularly rich in detail. Continental movement is most often illustrated with maps depicting the breakup of Pangea, with seafloor spreading as cause, subduction around plate boundaries as effect, and earthquakes as corollaries. However mantle plumes and hot spot geology are still under debate, awaiting fuller investigation of deep-earth heat anomalies at the core-mantle boundary. Meanwhile continuing eruptions of Kilauea reveal how continuous and slow moving lava flows can bury roads and overwhelm entire communities, thus impacting the welfare of humans.

Across the world's oceans the Hawaiian Archipelago islands and seamounts reveal tectonic movement underlying worldwide geological processes. In his early studies of seafloor spreading, Wilson (1963a) recognized islands as a primary source of evidence; his article on Pacific Ocean hotspot tracks showed several island and seamount chains—notably associated with Pitcairn and Samoa--aligned in the same direction as the Hawaiian Archipelago. These run west, driven by seafloor spreading from the East Pacific Rise, all attesting to underlying hotspots. Several of these tracks show the same bend toward the north that separates the Hawaiian from the Emperor seamounts,

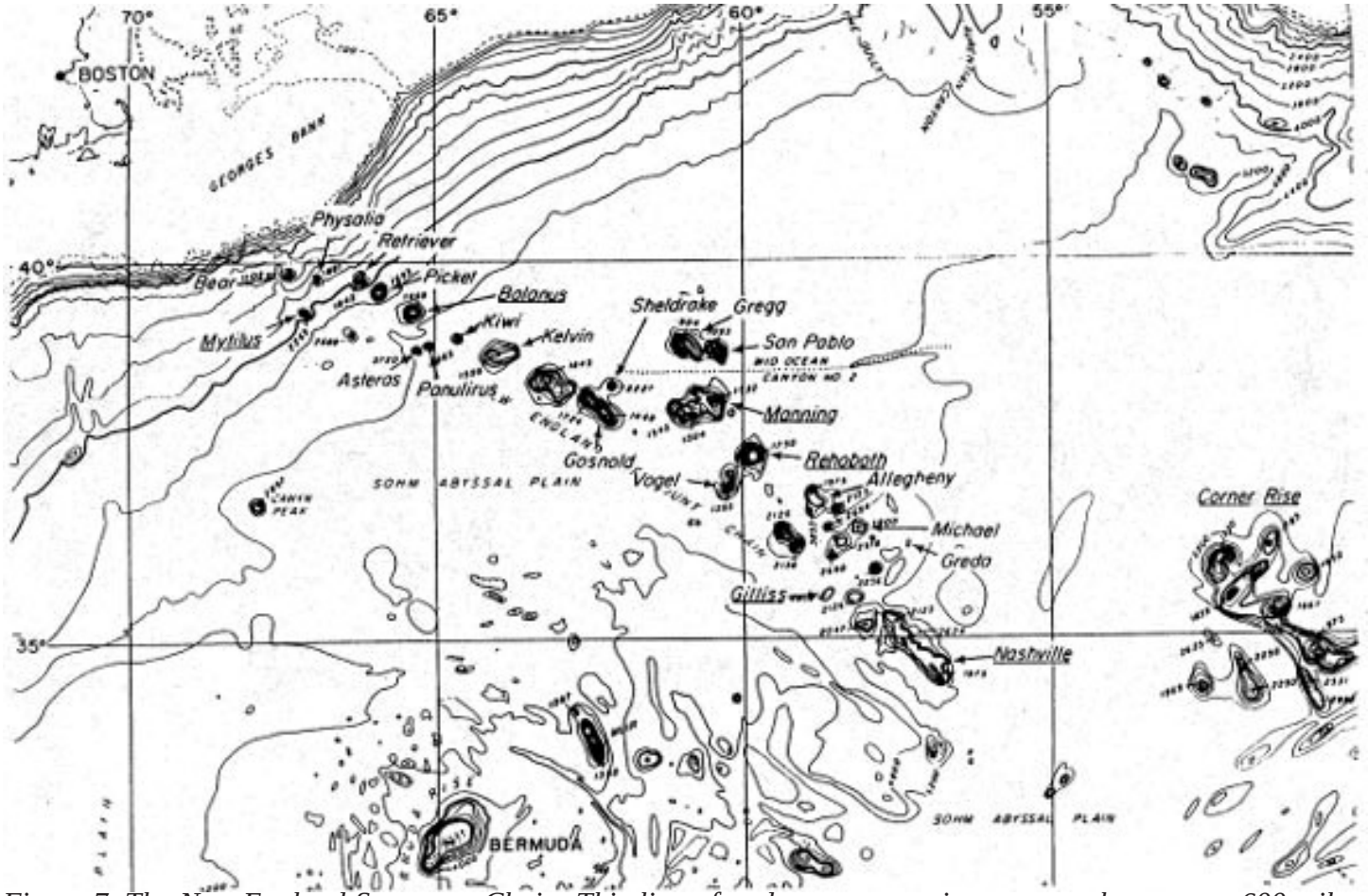


Figure 7. The New England Seamount Chain. This line of undersea mountains runs northwest over 600 miles, providing a record of the movement of the North American Plate away from the Mid Atlantic Ridge. Seamount creation originates with the Great Meteor hotspot northeast of Bermuda. Image: From Baab (2005).

thus pointing to the still-unexplained change in Pacific plate movement approximately 40 million years ago.

Numerous island and seamount chains in all major oceans record plate movement across assumed stationary hotspots. The New England Seamounts (Figure 7), a chain of more than twenty extinct volcanoes rising 4,000 meters above the Atlantic seabed, run for 600 miles, recording the westward movement of American plates away from the mid-Atlantic Ridge.

This chain, the longest in the Atlantic, has been created as the ocean seafloor rides over the Great Meteor Hotspot (Baab 2005). While identified primarily with these seamounts, this hotspot once powered volcanic activity in Canada under the Monteregian Hills near Montreal 125 million years ago, and later, under the White Mountains of New Hampshire (Scheirer, 2005). In 2016, President Barack Obama created the Northeast Canyons and Seamounts Marine National Monument, the first U.S. national marine monument in the Atlantic Ocean (Proclamation 2016), which protects the northwest section of the chain. The goal was the protection of an important biodiversity hotspot characterized by various rare and endangered species.

Other prominent examples revealing larger patterns of plate tectonics are found in the South Atlantic and Indian Oceans (Figure 8).

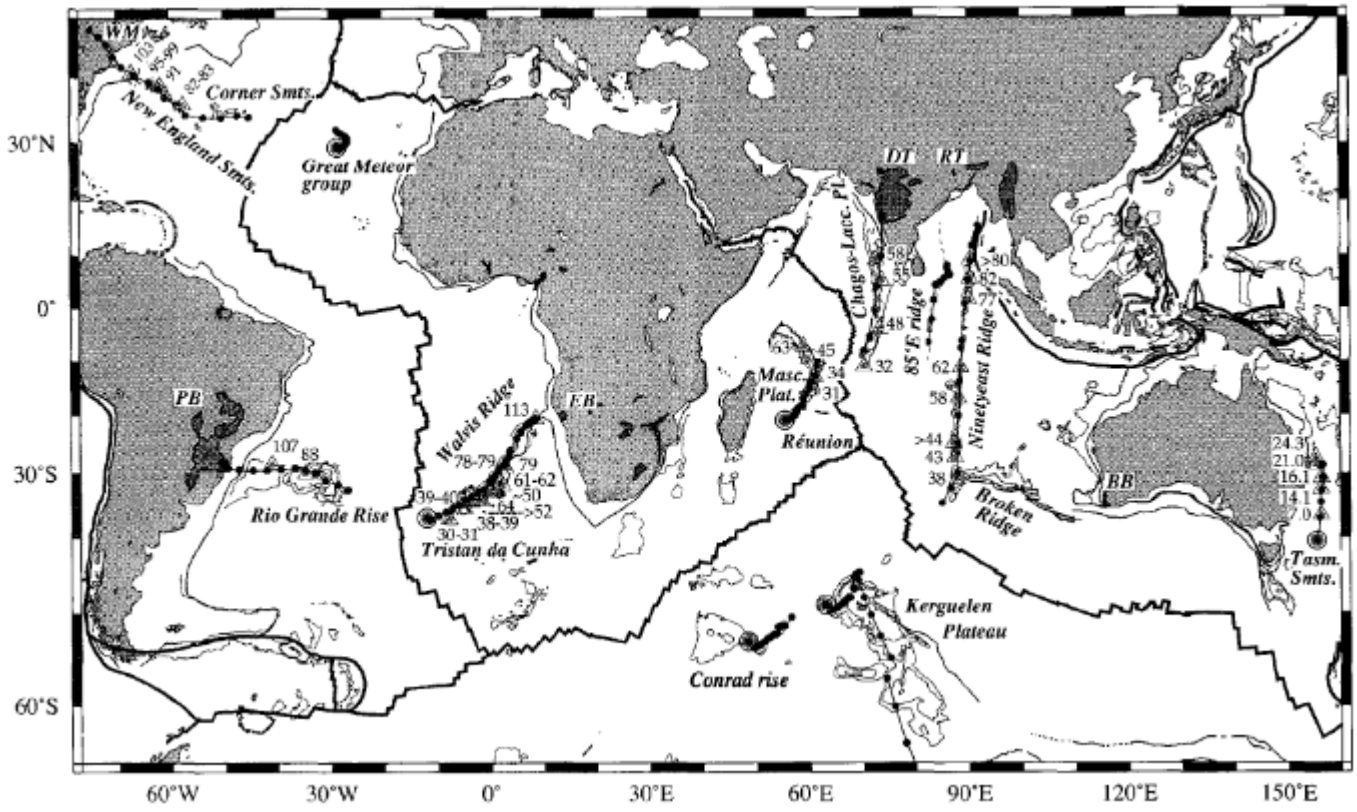


Figure 8. Major hotspot tracks in the Atlantic and Indian Oceans. Shaded dots mark the present locations of hotspots assumed to be fixed in the Earth's mantle; tracks are dotted at 5-million-year intervals. Tracks in the Atlantic reveal the movement of the earth's plates away from mid-ocean plate boundaries where mantle lava pushing upward is forcing plates apart. North running tracks in the Indian Ocean and east of Australia record the movement of the Indian plate from Pangea toward Asia 180 to 200 million years ago.
Source: Müller et al. Figure 1. Geology *(March 1993).*

The primary mechanism occurs at mid-ocean plate boundaries. Summarizing early discoveries, David Olroyd (2006, 100) notes, "It became evident that the ridges tended to have the same form as their adjacent coasts"—the mid-Atlantic Ridge and the facing coastlines providing the clearest illustration. Additionally, "the ridges were found to have narrow 'rift valleys' running along their submarine summits," often marked by black smokers. These were clearly the origination points for upwelling lava forcing plates apart. The Mid-Atlantic Ridge provides one of the most extended examples of seafloor spreading from the Arctic Ocean to the South Atlantic. The Rio Grande Rise records westward movement of the South American Plate away from the Mid-Atlantic Ridge. Its mirror image, the Walris Ridge provides evidence not only of the eastward movement of Africa away from the ridge but also an apparent northeasterly movement of the African craton from the more southerly location of Pangea where both continents began their present treks (Müller, Fig. 2).

In the Indian Ocean, north-south alignment of island and seamount chains trace to the northward movement of the Indian plate following the breakup of Pangea (Verzhbitsky 2003).

The Chagos-Laccadive Ridge (Figure 8), which includes the Maldives, runs for 1,600 miles from the present hotspot location at Réunion, with an apparent tectonic discontinuity northeast of Madagascar. Müller's north-end track extension beyond the Indian

Ocean indicates this hotspot may have been the eruptive source of the Deccan Traps of northwest India, sometimes cited as an alternate cause of dinosaur extinction 65 million years ago. The Ninety East Ridge (Stein 1974, Weis 1993), so named because it corresponds almost exactly with the ninetieth meridian (Figure 8), runs north from Broken Ridge for more than 2,000 miles; its age range, older at the north end, indicates a hotspot at the southern end active from 100 to 35 million years ago. East of Australia, the Tasmantid hotspot track records 25 million years of northward movement of the Australian plate.

Seafloor hotspots and seamount chains are often of minor interest: they may rise several thousand feet above the sea floor, but if their summits are hundreds of feet below sea level, their importance is confined to navigation hazards for submarines. Against this largely invisible activity, the current eruption of Kilauea presents a stunning view of island building on a five-vent volcanic assembly already surpassing most in elevation and extent. The flow of lava slowly wending itself to the sea marks clear a process that slowly extends island boundaries and broadens the island foundation as newly deposited chunks of basalt roll down its undersea slopes.

Hotspots on land are of much greater concern. The discovery of a huge caldera at Yellowstone provided the visible evidence that the park straddles a sleeping supervolcano (Figure 9).

In 1903, John Muir introduced the outdoorsman President Teddy Roosevelt to the magnificent landscape of northwestern Wyoming, part natural, part preternatural. Both recognized that it was a landscape unique on the continent, perhaps in the world. Consequently, Roosevelt took steps to preserve it, the first such decision in American history. Yellowstone thus became the flagship national park for a system that has grown to millions of acres. But Yellowstone remains unique, and today millions of visitors annually are entertained by what the park offers rather than recognizing it as the most dangerous supervolcano on the planet.

Following half a century of observation,

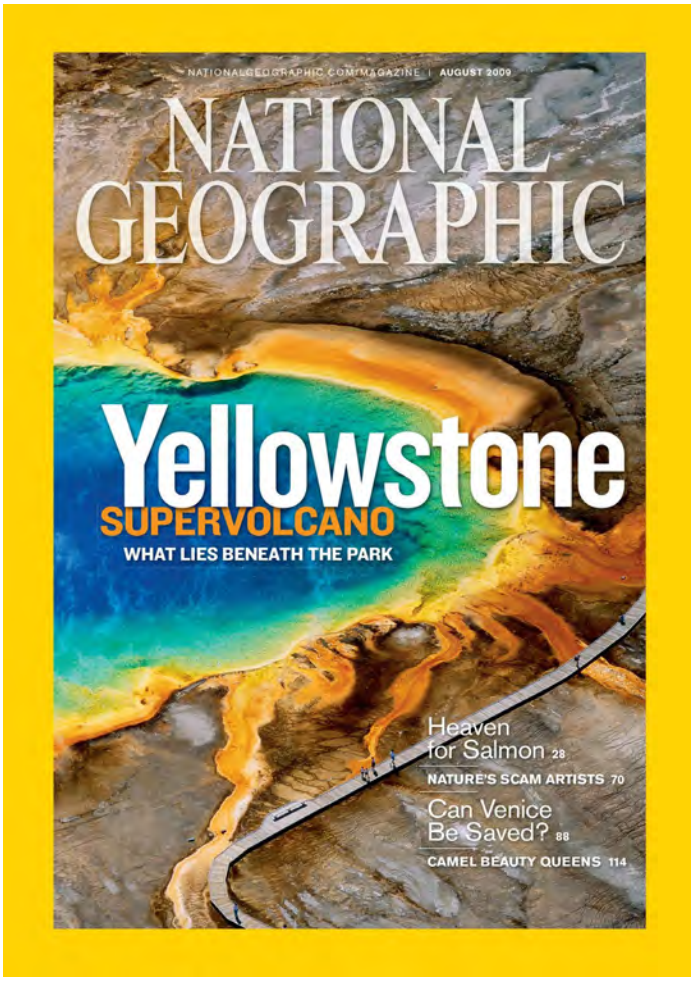


Figure 9. National Geographic Cover, August 2009. Public awareness of the Yellowstone supervolcano dates to the popular press and videos such as the Yellowstone episode in the History Channel series, How the Earth Was Made, *First Season (2009).*

geophysicist Robert B. Smith (1979) published a striking discovery: that surface uplift of 30 inches had occurred at Yellowstone over the half century since he began his research in the park in 1923. The result was recognition that Yellowstone is situated within an ancient caldera atop an enormous hotspot.

Neither Smith nor millions of visitors were aware that this was a scene of a prehistoric eruption because its calderas had been destroyed by erosion long before historical times. Following his recognition, however, Smith and other geologists have undertaken study of crust beneath Yellowstone, revealing a huge

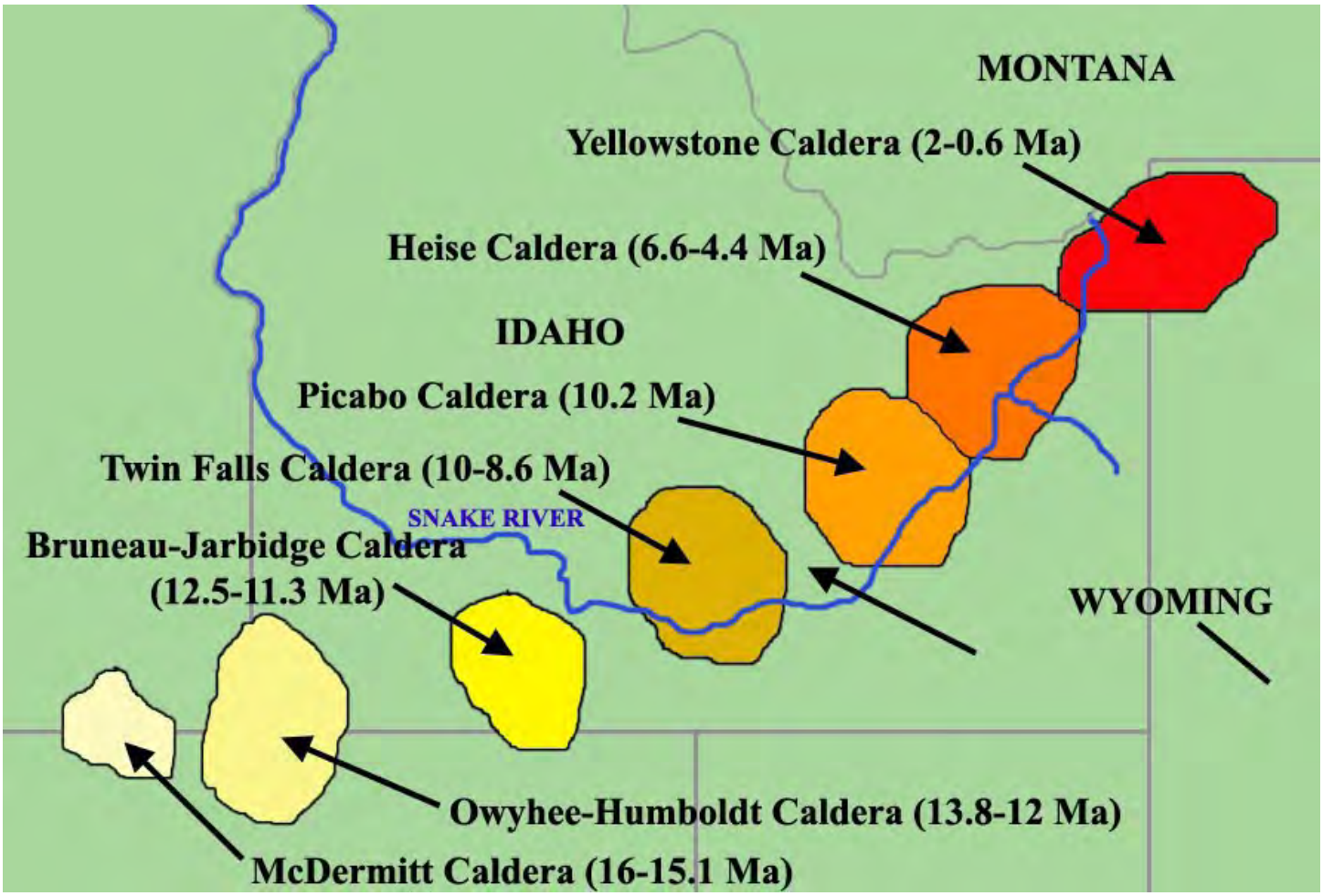


Figure 10. The Snake River Hotspot Track. From Yellowstone National Park in the northwest corner of Wyoming, a southwest movement of the North American plate across a stationary hotspot (now under the Yellowstone Caldera) has generated a line of heavily eroded calderas across the Snake River Plain of Southern Idaho. Dating indicates eruptions from the McDermitt Caldera 16 million years ago on the Oregon-Nevada border to the most recent under the Yellowstone Caldera 600 thousand years ago. Source: Diagram sketched from Branney (2007), Fig. 1.

chamber of magna. Its signs today are sulphur vents, bubbling pools of water, hot mud flats, and rising clouds of noxious fumes, along with phenomena like the Old Faithful Geyser that seems particularly designed to attract a crowd of spectators awaiting its regular eruptions, which occur approximately every ninety minutes. In addition swarms of deep-origin earthquakes have been a regular occurrence, suggesting that an eruption could break out in the next several thousand years (Achenbach 2009).

More recent geological analysis dependent on sophisticated aerial observation and ground-penetrating technology, in combination with plate tectonics (Branny *et al*. 2008), has revealed that the westward movement of the North American plate across the Yellowstone caldera has generated a line of at least six earlier craters across the Snake River Plain to the Oregon-Nevada border (Figure 10).

This hotspot track provides a geological record of 15 million years of plate movement over the Yellowstone hotspot.

Slow-flowing basaltic lava is typical of hotspot

eruptions; years of lava flow at Kilauea provide an apt illustration of slow buildup thousands of feet in elevation. "Hawaiian" is now the name for this kind of low-volume, continuous, effusive volcanic type (O'Meara 2008, 40). In contrast, subduction volcanoes along plate margins in the well- known Ring of Fire around the Pacific tend toward explosive eruptions (Gilbert and Sparks 1998) like the 1981 explosion that blew out half the summit of Mount St. Helens, and the 2018 eruption of Mount Mayon in the Philippines. Here, water carried down with subducting seafloor turns to steam at depth, providing an engine for inland volcanoes like the dozens of extinct volcanoes that run parallel to the coast of California, Oregon, Washington, and British Columbia. However, despite anxiety on the Big Island fueled by a succession of new crevices and continuous activity over 35 years, Kilauea seems less likely to explode and more likely to continue pushing out miles of slow-moving rivers of lava.

Meanwhile, as this drama continues, a new one is rehearsing in the green room. Twenty miles off the southeast coast of the Big Island, the thermal plume is actively feeding a new seamount, Lo'ihi, which is slowly rising from the flank of Mauna Loa, a predecessor of Kilauea and the largest shield volcano in the world. The evidence suggests that Lo'ihi will be the next Hawaiian island. Its beginning is estimated at 400,000 years ago; it is already 12,320 feet in elevation above the seafloor while its summit remains 3,200 feet below sea level. It covers an elongated seafloor area 8 by 16 miles, the feature behind its name Lo'ihi ("long"); it is growing with 90% of ejected lava sliding down the slopes, progressively enlarging its foundation. At its present rate of growth, it is projected to reach the ocean surface in approximately 50,000 years, by which time the Big Island will have moved another three miles to the northwest. If Lo'ihi continues to add elevation and bulk, it could add a seventh volcano to the Big Island's six, enlarging its area and shoreline by many miles.

Lo'ihi, which is now the 107th volcano in the 3,600-mile Hawaiian-Emperor Archipelago, was first thought to be an inactive volcano, but seismic activity led to its recognition as an active seamount in 1955. For years it was studied remotely from undersea cameras and samples dredged up from its summit. Two decades from its discovery to the first descent to its peak in 1987 provides an index of difficulties in exploring ocean depths: in the 23-year interval, we put humans into space, made seven landings on the Moon, and lofted 14 Space Shuttles into orbit.

Lava ejected under water cools rapidly, cracking into boulders and irregular rubble known as talus, not unlike steep scree fields around eroding mountains. Oceanographer Richard W. Grigg (2014, 17-19) describes the preternatural scene he discovered on his descent to Lo'ithi. Huge blocks of lava rest on an unstable foundation, the result being constant slippage detected by seismographs. Earthquakes are frequent, instruments regularly register landslides. Since records began in 1959, between two and ten earthquakes per month have occurred near the summit. In 1996, seismographs registered a swarm of 4,070 earthquakes in a three-week period, a record for any Hawaiian volcano. The result was massive changes: a crater six-tenths of a mile across and 1,000 feet deep formed amidst the rubble, along with the collapse of "Pele's vents"—named for the Hawaiian goddess of volcanoes—which had formerly been considered stable. The crater has now been renamed "Pele's Pit."

Conditions around Lo'ihi's vents at the summit are toxic. The water temperature averages 196 degrees Fahrenheit (90 Celsius), though its ejection temperature has been measured at 250 Celsius. Oxygen is missing from the seawater; carbon dioxide and iron compounds prevail. The seamount is characterized by at least eight hydrothermal vents, both at its summit and down its flanks, around which non-oxidizing microbes thrive (McMurtry, 1987). These resemble microbial communities around black smokers along mid-ocean ridges, now considered a likely location for the first emergence of life nearly 4 billion years ago. Grigg (2014, 19)) suggests that "the summit of Lo'ithi may be the most naturally polluted place in Hawai'i,"

adding that "the poisonous zone around the summit of Lo'ithi does not extend to greater depths" where various species of non-vertebrates and fish have been catalogued.

Remarkable and unusual forms of life are typical of the flanks of the Hawaiian islands, including the hundreds of miles of seamounts to the northwest. Grigg (1988, 2008) was instrumental in establishing the importance of precious corals in the Hawaiian seamount chain. This has motivated extraordinary efforts to protect the undersea ecology, most recently the creation of a vast sea-bottom marine preserve (Figure 11).

As the largest undersea preserve of several around Pacific islands under American control—and in fact in the world—it stretches across 1,350 miles of Hawaiian islands and seamounts, protecting more than 582 thousand square miles of ecologically rich coral and sealife. Created in 2006 by President George W. Bush, it was enlarged by President Barach in 2010 (Barnett 2016).

A Big History course presentation of Hawaii's origins provides an incisive introduction to plate tectonics and hotspots and their worldwide occurrence, along with exploration of one of the most environmentally rich regions on Earth. The National Geographic video *Wild Hawaii* (2014) provides a spectacular survey of both the islands and the undersea world of the seamounts. Recognition of marine preservation importance is evident in the creation and enlargement of the western seamount monument now designated a World Heritage site by the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

In a treatment of "deep time," oceanographer Grigg (2014, 24) has pointed to the imaginative expansion the Hawaii story engenders. "How long will it take Lo'ithi to break the ocean surface and

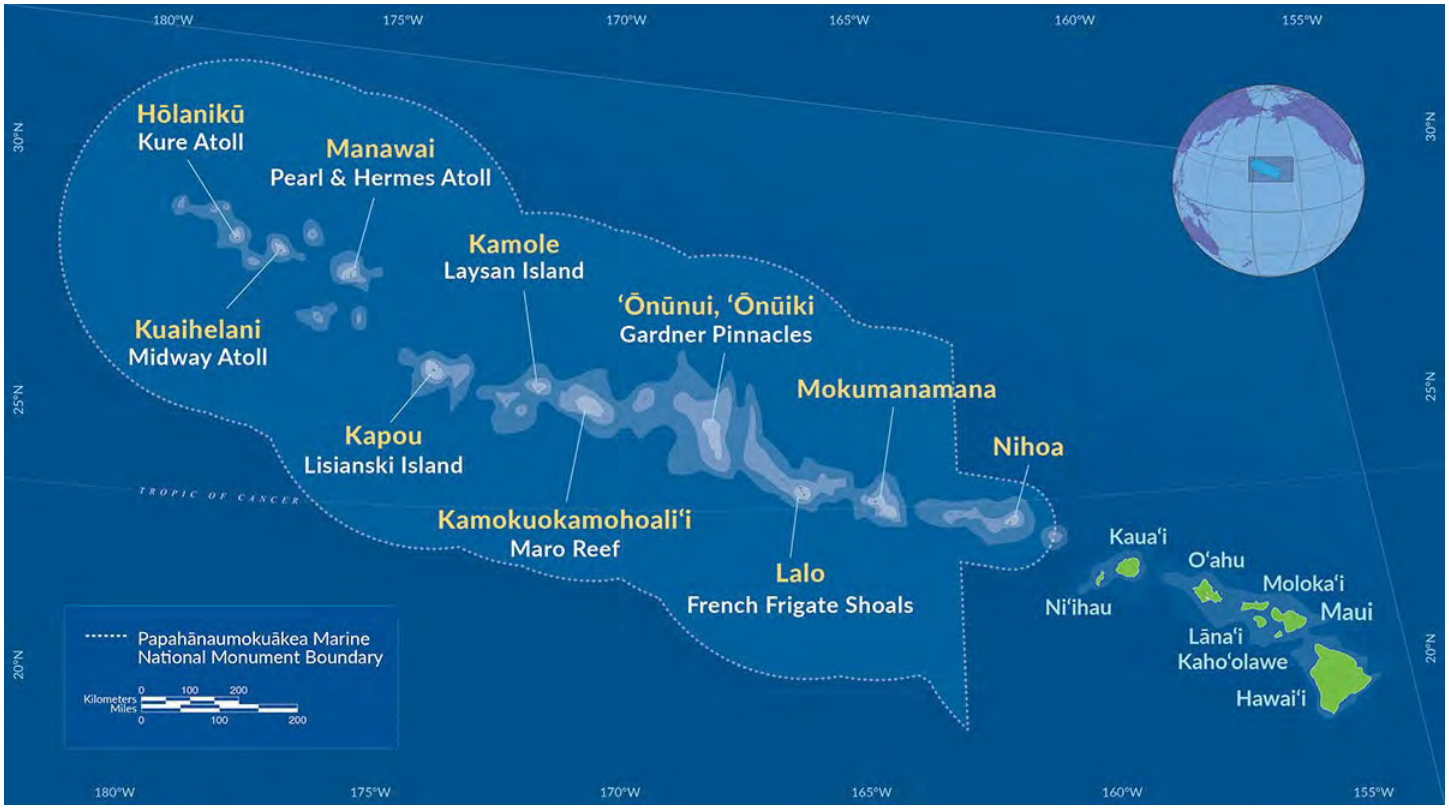


Figure 11. Papahānaumokuākea. This Marine National Monument, created by President George W. Bush, enlarged by President Barach Obama, and designated a World Heritage Site by UNESCO, extends across the entire western end of Ko Hawai'I Pae Āina (The Hawaiian Archipelago).

become an island and then drift off the hot spot to the end of the island change and then keep driving to final subduction beneath Kamchatka? The answers are about fifty thousand years, then thirty million years, and finally about seventy million years. How can human minds imagine such immensities?" Grigg's questions evoke the kind of response James Playfair (1802, xiv) recorded more than two hundred years ago on the view of deep time unfolded by James Hutton: "The mind seemed to grow giddy by looking so far into the abyss of time . . . how much farther reason may sometimes go than imagination can venture to follow." Grigg refers to the same power of reason: "By projecting one's mind into the murky past or unknown future of both geological and biological evolution, it is possible to imagine such things." His perspective provides a philosophical underpinning for the task of Big History: "By mentally going there, we extend our own mortality to a virtual immortality. . . . we must continuously think about the huge amount of time that it took" (Grigg 2014, 24-25).

Mention of Pele's vents and Pele's pit reminds us of the pervasive mythology of Pele, Hawaii's Goddess of Fire and Volcanoes who dominates the lore of the islands. Migrant settlers from islands to the south who arrived at the Hawaiian Islands between 1,500 and 1,200 years ago imported a mythology that has evolved within this new environment. In a startling correlation between the real and the imaginary, Pele is said to have settled first Ni'ihau, the oldest of the Hawaiian islands, then migrated southeast to the newest, the Big Island where she now resides. Her migration means she has always been present where volcanic island building was underway. But while Pele is now considered resident around Mount Kilauea, her vents, now collapsed into Pele's Pit, suggests she may make periodic visits to Lo'ihi.

In my version of Big History—the University of Houston core-curriculum course *Cosmic Narratives*—I refer to mythic stories as "ancient cosmic narratives," which defines the changes from prescientific to scientific origin stories as an evolution rather than repudiation. The mythology surrounding Pele is easily discovered in Martha Warren Beckwith's *Hawaiian Mythology* (1982) and well-illustrated with paintings, prints, and illustrations by artists: Herb Kawanui Kane, Dietrich Varez, and the still active artist Wallace Kong.

Herb Kane (1928-2011), educated in the School of Art Institute in Chicago, turned his interest and skill in sailing to the design of a voyaging canoe—undertaking a Kon Tiki-like demonstration of sailing between Tahita and Hawaii, the route of the original Polynesian settlers of the islands. Author of *Pele: Goddess of Hawaii's Volcanoes* (1987), an illustrated retelling of the Pele legends, and *Voyagers* (1993) on the marine background of Hawaii's settlement, Kane produced dozens of paintings that captured the union of geology and mythic narrative. Seven Kane commissioned paintings, undoubtedly the result of Hawaii's recent addition (1959) as the newest American state, appeared in the December 1974 issue of *National Geographic*.

Dietrich Varez (1939-2018), German by birth, settled on the Big Island in an upland forested area where he carved wooden images of Pele, illustrated more than a dozen books, developed a line of handmade jewelry, and produced hundreds of prints (See Figure 2). Living a self-sufficient pioneering life in a home he built near Kilauea, he and his family lived close to the land, collected rainwater, and went without electricity for thirty years, Varez symbolizes an environmental idealism few today follow.

Wallace Kong, who continues to work in Honolulu, has focused on the dramatic landscape of Hawaii, its peaceful beaches, craggy mountains, and steeply eroded cliffs. Among these spectacular scenes, his painting, "Pele Rejoicing" (Fig. 11) captures the calm of the supreme goddess with a reassuring gesture against a lava-lit sky and towering clouds of eruption.

As a collector of god and goddess statues found in China, Malaysia, Singapore, and Thailand, I was interested in locating a sculpture of Pele to add to my mantle collection. In talking to numerous residents and shopkeepers in Honolulu, I discovered that statues

of the goddess did not seem to exist; in fact, I was told that Pele herself would be angered if anyone tried to create such an artifact, though it is evident that some have been carved. What emerged from conversations were personal narratives with a common theme of Pele's vengeful influence over people who offended her. According to stories heard several times, tourists who had picked up and carried off pieces of Hawaiian lava typically fell victim to bad luck, even personal disaster. Warned by Hawaiian residents that Pele would seek revenge for such looting of her territory, I became the recipient of modern legends that it was not uncommon for former tourists to mail back their volcanic souvenirs in hopes of making peace with Pele and restoring their lives to normal.

In retrospect, I am perhaps better off without Pele on my mantle.

Figure 12. Pele Rejoicing. A painting by Hawaiian artist Wallace Kong captures Pele as the benign goddess of the Hawaiian land and people, unperturbed by the background of an eruption-lit sky and towering volcanic dust clouds. Image used by permission.

Acknowledgements

Wherever possible, maps and images are from open access news agencies or government sites. Wallace Kong's copyrighted image, *Pele Rejoicing* (Fig. 12), is used by permission. Special thanks are due to geologist-reviewer Olga Garcia-Moreno for a perceptive reading, helpful references, and careful editing. Every attempt has been made to locate the earliest copyrighted sources for illustrations, maps, and other images.

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Erupções do Kilauea e o arquipélago havaiano: a geologia da tectônica de placas e dos pontos quentes

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Abstract

A four-month surge of Mount Kilauea eruptions (May to August 2018) on the Big Island reminds us that the whole chain of Hawaiian islands has been built by volcanic activity. Kilauea is one of five volcanoes that built the Big Island; a future island (Lo'ihi) is growing on the seafloor 20 miles to the southeast. A plume of rising magma from deep inside the Earth's mantle underlies a seafloor hotspot; lava is forced through vents in the Earth's crust; as the Pacific seafloor moves northwest from its origin at the East Pacific Rise, this stationary hotspot creates a line of volcanic islands. To the northwest, submerged seamounts remain as remnants of former islands once formed over this hotspot. A northward chain known as the Emperor Seamounts reveals that this same hotspot has created more than 100 volcanoes over 70 million years. The Hawaiian and Emperor seamounts are not unique. The New England Seamounts off the coast of Massachusetts, and similar lines in the South Atlantic record the east-west spread of the Atlantic seafloor over mid-ocean hotspots. In the Indian Ocean, north-running seamount chains record the northward movement of the Indian plate following the breakup of Pangea. In the United States, a line of extinct craters west of Yellowstone across Idaho mark the westward movement of the North American plate over the hotspot now under Yellowstone.

O aumento dramático da atividade vulcânica na Ilha Grande do Havaí, começando em 3 de maio de 2018, é assunto de fotografias na internet e informes diários, geralmente como notícias isoladas: uma nova fenda, um explosivo show de fogos, um bloqueio na estrada, lava caindo no mar, casa destruídas, residentes evacuados, espectadores presos por escalar barricadas, pedidos ao FEMA [1] por ajuda de emergência. Raramente encontramos as erupções do Kilauea no contexto

Figura 1. Fluxo de Lava do Kilauea. O Monte Kilauea, na Grande Ilha do Havaí, está em erupção silenciosa desde 1983, com impacto limitado nos habitantes da ilha. Desde 3 de maio de 2018, um aumento dramático de atividade vulcânica afetou bairros e moradores, forçando as evacuações e enviando fluxos de lava para a costa leste. Foto: NPR.

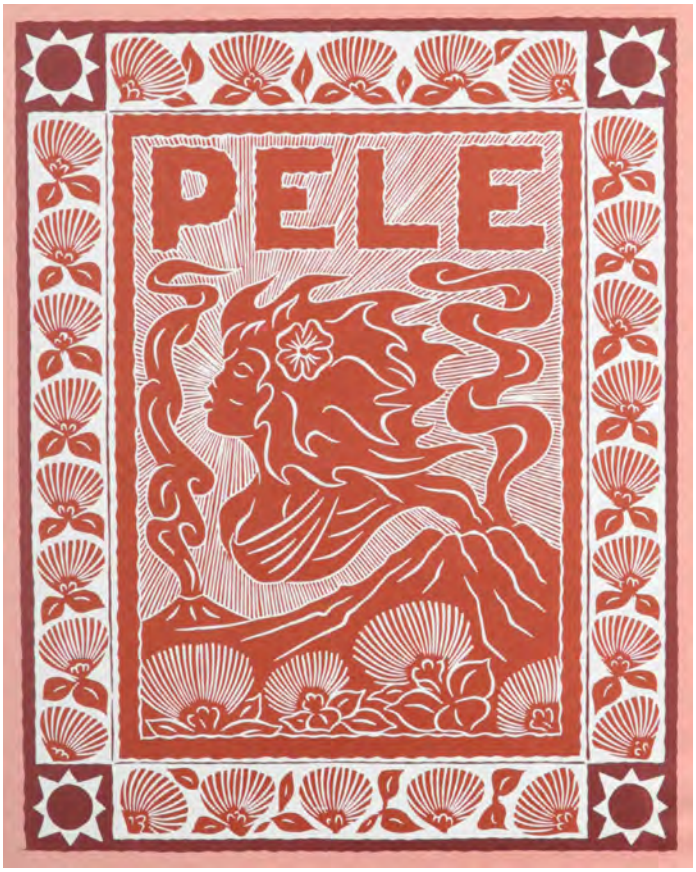

Figura 2. Dietrich Varez é um dos vários artistas que criaram imagens do mito havaiano associado à sempre presente atividade vulcânica. Aqui a capa de Pelé: A Deusa do Fogo (1991) ilustra suas inovadoras pinturas impressas que acompanham a história de Pele de Pua Kanaka'ole Kanahele publicada pelo Bishop Museum Press, Honolulu

mais amplo da criação de ilhas, plumas mantélicas, tectônica de placas, a evolução das ilhas em atóis e a surpreendente linha de montes submarinos que corre em sentido noroeste com um abrupto desvio para o norte, evidente na cadeia de montes submarinos do Imperador, que segue em direção às Aleutas, a 5800 km^2 de distância.

Quase diariamente temos uma visão dramática de mudança geográfica em um contexto atualmente bem compreendido, um processo visível, fotografado, filmado e mostrado nos telejornais. Aqui o passado mora no presente, não apenas no contínuo deslocamento das ilhas havaianas pelo Pacífico, mas também na construção de ilhas, incluindo um novo vulcão submerso a alguns quilômetros de distância destinado a se tornar outra ilha na cadeia havaiana. O que está acontecendo na Ilha Grande fornece uma oportunidade educativa que cai como uma luva em uma narrativa da Macro História e é de fato melhor entendida como um episódio excepcionalmente dramático na história mais ampla da transformação geológica. Os havaianos estão intensamente cientes do drama, não apenas pelos terremotos, erupções e fluxos de lava mas também pelas histórias seculares de Pele, deusa dos vulcões do Havaí. Momentos de quietude e súbita violência vulcânica correspondem a suas emoções de amor e devoção conforme ela vive uma complexa existência mítica que algumas vezes envolve traições e vinganças seculares. Como professores de Macro História em busca de ilustrações dramáticas de mudanças geológicas em andamento, nos compete aproveitar esses eventos para articular um dos capítulos centrais neste épico da Terra – uma das poucas narrativas da Macro História que podem ser trazidas à vida no presente.

Mais de um século atrás, o geólogo James Dana visitou as oito maiores ilhas do arquipélago havaiano. Ele observou uma diferença significativa em suas idades: as ilhas mais a noroeste, Kaua'i e Ni'ihau eram as mais velhas; as outras eram progressivamente mais novas, com a Ilha Grande na ponta sudeste sendo a mais nova. Em seu livro *Characteristics of Volcanoes, With Contributions of Facts and Principles from the Hawaiian Islands* (1891), Dana apontou que conforme nos movemos rumo ao noroeste ao longo da cadeia de ilhas, vemos que a erosão está progressivamente mais avançada, um sinal claro do aumento da idade. Dana não foi capaz de fornecer uma explicação e nenhuma surgiu nos 60 anos seguintes. A teoria da deriva continental proposta por Alfred Wegener em *The Origin of Continents and Oceans* (1915) impressionou apenas poucos geólogos por falta de

qualquer explicação de como os continentes poderiam se mover. Mas, observações coletadas durante o Ano Internacional da Geofísica (IGY, na sigla em inglês) que durou de julho de 1957 a dezembro de 1958, levaram a uma perspectiva geológica nova e dramática. O oceanógrafo Robert Dietz, que trabalhou com a Geodetic Survey[3] durante o IGY, publicou a teoria da evolução da bacia oceânica e a expansão do fundo oceânico. Seu colega de pesquisa, o geólogo Harry Hess, que havia servido na marinha norte-americana estava preocupado com possíveis obstáculos no leito marítimo que pudessem interferir com o movimento de submarinos profundos; seu livro, *The History of Ocean Basins* (1962), identificou dorsais oceânicas e agregou fundamentos teóricos para a teoria da expansão oceânica.

Desse agregado de publicações nasceu a teoria da tectônica de placas e os geólogos começaram a examinar todas as partes do planeta, incluindo o arquipélago havaiano. O geólogo canadense John Tuzo Wilson (1963) sugeriu que a placa tectônica sob o Oceano Pacífico poderia estar se movendo sobre uma fonte estática de lava ascendente que ele chamou de "ponto de fluxo": dessa forma "cada ponto de fluxo dá origem a uma sucessão de vulcões." Chris Christofferson recebe o crédito por cunhar o termo "ponto quente" para o ponto de fluxo de Wilson, ao qual o geólogo de Princeton, W. Jason Morgan (1971) adicionou a teoria das plumas térmicas, que viriam das profundezas do manto terrestre, como uma explicação para os pontos quentes. Em uma única década, uma teoria geral de mudança geológica estava posta, fornecendo um alicerce para o entendimento do surgimento de montanhas, da ocorrência de terremotos e da concentração de atividade vulcânica nas margens das placas tectônicas. Para nossos propósitos, o reconhecimento do movimento de placas e do imobilismo dos pontos quentes forneceu uma explicação para a criação das ilhas havaianas e, na realidade, consideravelmente mais.

Esse pode ser o momento apropriado para fornecer uma justificativa para esse trabalho. Observando precursores da Macro História – Preston Cloud com *Cosmos, Earth, and Man* (1978), Nigel Calder com *Timescale* (1983), Brian Swimme e Thomas Berry com *Universe Story* (1988) – notamos que o Havaí não recebeu nenhuma atenção. Em nossos proeminentes livros de Macro História – *The Structure of Big History* (1996), *Maps of Time* (2004), *Big History from the Big Bang to the Present* (2007), *Big istory: Between Nothing and Everything* (2014), *A Most Improbable Journey* (2017) e *Origin Story* (2018) – menções ao Havaí são limitadas aos migrantes que povoaram o arquipélago há alguns séculos vindos das ilhas do sul. Mesmo o livro *Big History* (2016), que ilustra esquematicamente a tectônica de placas, ignora a criação das ilhas havaianas. Ainda assim, essa narrativa de 70 milhões de anos representa um dos capítulos mais dramáticos da parte da Terra da Grande Narrativa.

Figura 3. As fontes de lava das fissuras do Kilauea fluem em direção ao oceano, alterando e estendendo o litoral. A lava que chega à costa leva a um encontro explosivo - uma batalha de fogo e água. Desde maio de 2018, centenas de acres foram adicionados à costa leste da Ilha Grande. Foto: USGS.

Se começarmos com a Ilha Grande onde rios de lava com profundidade de alguns metros se espalharam por vários hectares nas últimas semanas, nós vemos

uma versão em miniatura de como a Ilha Grande surgiu. O começo foi há 600 mil anos com Manukona, o primeiro de seis vulcões, que ficou em erupção por aproximadamente 300 mil anos até que o movimento da placa levou ao surgimento de outro vulcão, Kohala, quilômetros a leste e que eventualmente se juntou ao Manukona. Isso continuou com os vulcões subsequentes – Mauna Kea, Mauna Loa, Huadlalai e finalmente Kilauea, cada um subsumindo os anteriores, cada um menor que o anterior, com Mauna Kea atingindo 4.000 m acima do nível do mar. Esse resultado é uma ilha composta de mais de 10.000 km² com uma média de 100 km de diâmetro. O terço exposto da ilha esconde uma massa de terra submersa de 6.000 m, o que, junto com a elevação da ilha forma uma montanha de quase 10.000 m de altura, 1.000 metros maior que o Everest. O declive suave da ilha espalha-se por mais de 75.0000 km² sob o mar. O material vulcânico suficiente para criar uma ilha dessas dimensões desafia a imaginação e sugere que episódios de erupção contínua foram a regra e não a exceção.

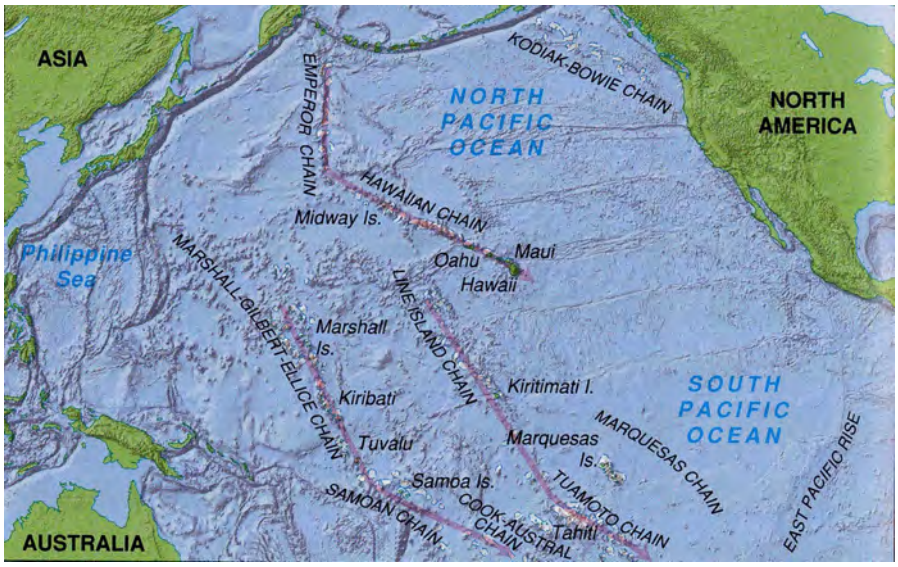

Figura 4. A Ascensão do Pacífico Leste. Esta cordilheira norte-sul de montanhas submarinas, com uma altitude de 9000 pés ao sul da Baixa Califórnia, marca um limite de placa, uma fratura crustal onde o fundo do mar está sendo criado, espalhando-se para o leste em uma trincheira de subducção sob a América do Sul e noroeste do Pacífico. passagem pelo hotspot do Kilauea, marcado por uma das mais longas cadeias de ilhas e montes submarinos do planeta.

https://homesecurity.press/quotes/emperor-seamount-on-a-map.html

O movimento dessa massa gigante é parte de uma história muito maior. A ilha está se movendo porque a crosta oceânica na qual ela está assentada está se movendo, seguindo para noroeste nas correntes de convecção do monto. Baseado em amostras do fundo do oceano e no paleomagnetismo, o leito submarino sob a Ilha Grande tem aproximadamente 80 milhões de anos. Como as crostas oceânicas ao redor do mundo, foi criada em uma fronteira tectônica onde a lava ascendente separou lentamente as placas tectônicas, no caso a do Pacífico Oriental que se afasta da Baixa Califórnia e se mantém paralela à da América do Sul a uma distância de muitos milhares de quilômetros. O leito submarino sob o Havaí está numa jornada que o levou a 5.500 km de seu ponto de origem.

Indo para o noroeste a partir da Ilha Grande ruma às outras sete ilhas espalhadas por uma distância de 570 km, chegamos ao muito mais antigo Ni'ihau, originalmente com mais de 1.300 m de altitude, mas agora reduzido a menos de 400 m. Como a crosta oceânica abaixo, essas ilhas estão se movendo para noroeste a uma velocidade de 7 a 10 centímetros por ano, o que, perfaz os 5 a 6 milhões de anos de idade que têm o Ni'ihau e Laua'I. Indo mais a noroeste, a 1.700 km, encontramos 10 ilhas menores, incluindo Midway e Kure; o arquipélago havaiano todo se estende por quase 2.300 km. Mas entre esses quilômetros e para além deles, existem inúmeros atóis e ilhas submersas conhecidas como montes submarinos, a cadeia inteira chegando a 70 vulcões criados ao longo de 50 milhões de anos.

A elevação geralmente decrescente das ilhas

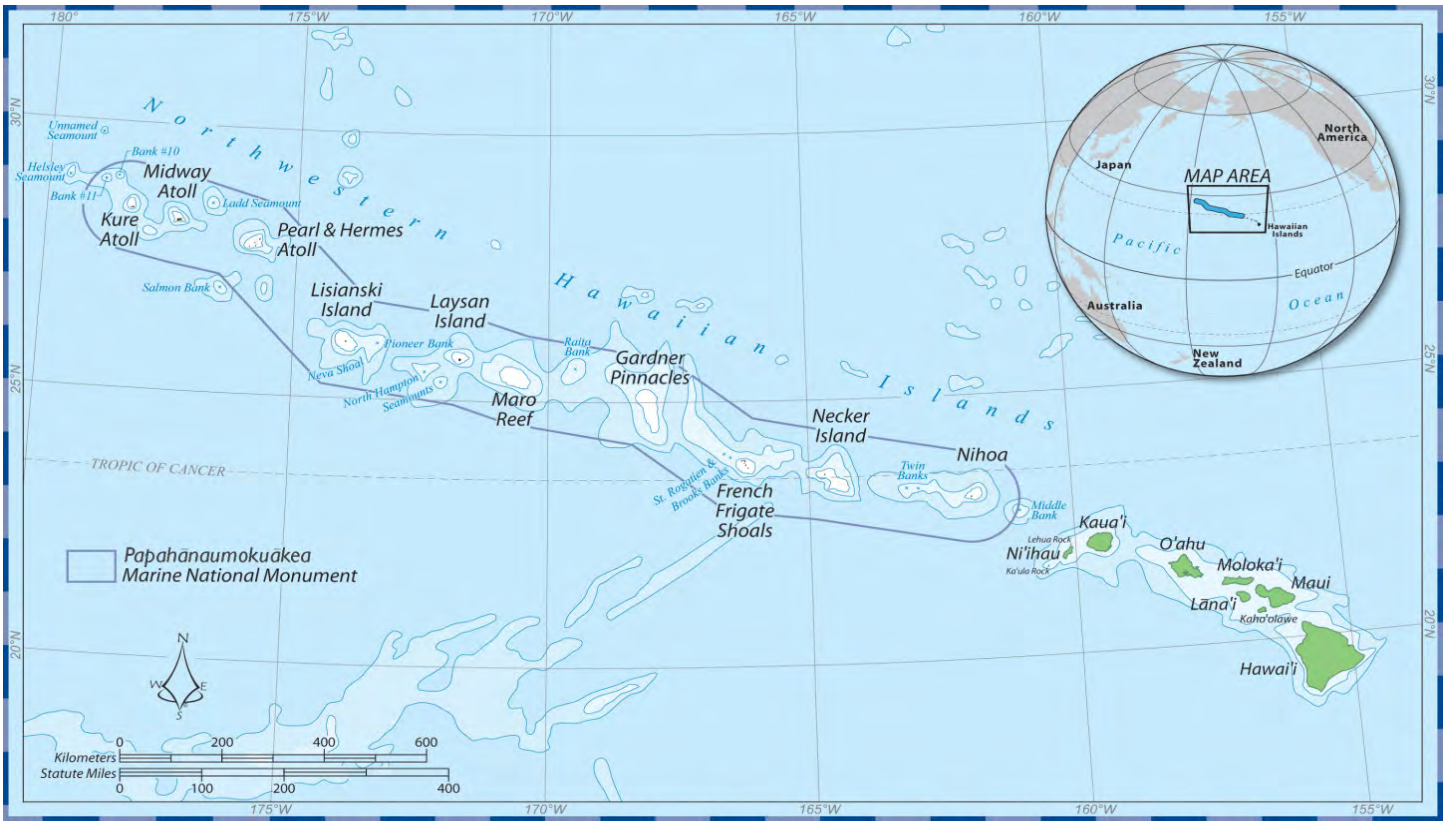

Figura 5. As Ilhas Havaianas e Seamounts. As ilhas principais podem ser vistas na extremidade direita (sudeste) da cadeia. À medida que as ilhas se movem para noroeste, elas deslizam abaixo do nível do mar, formando uma linha de 1400 milhas de montes submarinos.

Illustration: https://oceanexplorer.noaa.gov/okeanos/explorations/ex1504/background/mpas/media/pmnm-hires.jpg.

conforme elas se movem para noroeste e sua eventual descida abaixo do nível do mar responde à configuração do manto terrestre. Geólogos suspeitam que um a protuberância ascendente associada com o ponto quente encontra-se abaixo das ilhas principais, criada talvez por um bolsão de magma perto do limiar entre o manto e a crosta. Isso pode explicar a profundidade oceânica reduzida a 1.000 m. Conforme a crosta terrestre se aproxima do ponto quente, ela sobe a protuberância; conforme ela atravessa o ponto quente ela atinge sua elevação máxima durante várias centenas de milhares de anos de erupção contínua. A evidência de múltiplas fendas e aberturas ao redor do Kilauea indica que a pluma térmica sobe através de várias ramificações que podem variar em força de erupção conforme a crosta se move, algumas chaminés são fechadas enquanto outros canais de lava são abertos. Durante dois ou três milhões de anos, cada ilha fica por cima dessa protuberância até que, algumas centenas de quilômetros para noroeste, começa a descer o declive, perdendo assim 1.000 m de elevação. Na maioria dos casos, isso, combinado com a erosão da paisagem montanhosa resulta no desaparecimento da ilha abaixo do nível do mar, onde permanece como um monte submarino.

A uma distância de 3.200 km da Ilha Grande, uma anomalia impressionante acontece. A linha de montes submarinos muda abruptamente de direção, indo rumo ao norte, em direção à península russa de Kamtchatka, onde os montes submarinos entram em uma zona de subducção de 10.500 m de profundidade na fossa das Curilas-Kamtchatka. A cadeia submersa contém outras 40 ilhas submersas conhecidas como a cadeia

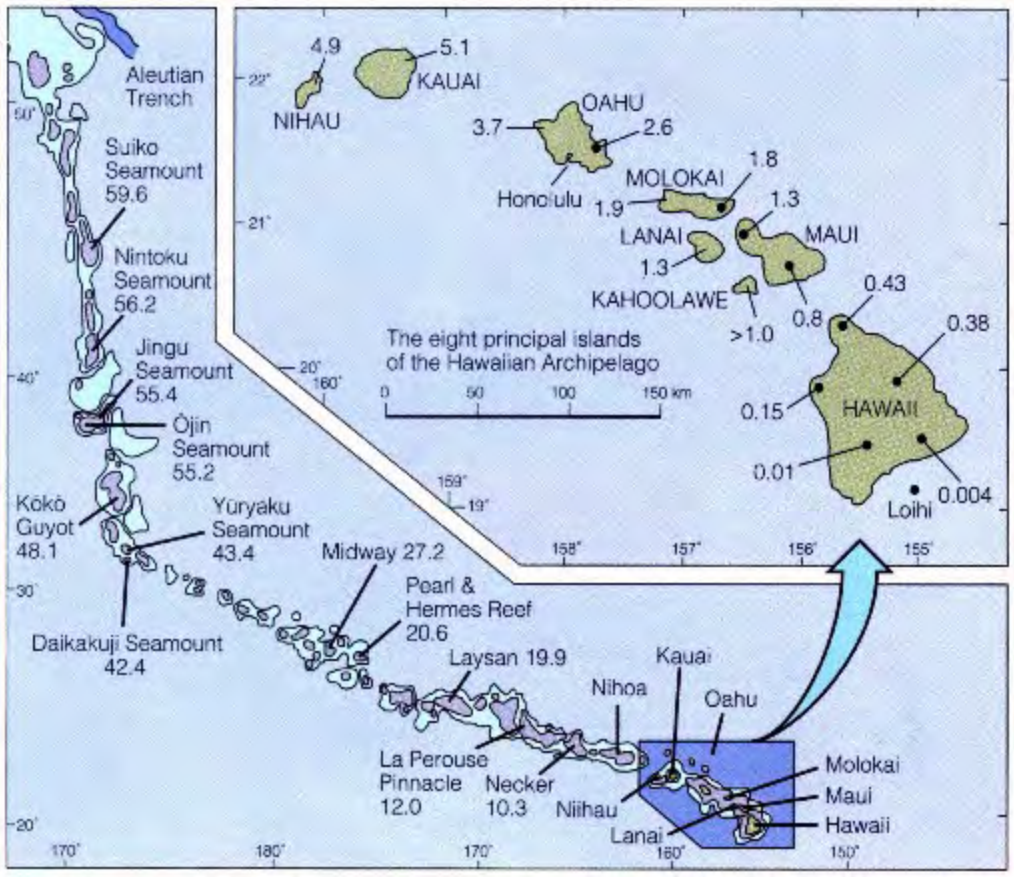

Figura 6. A Serra do Havaí e Seamounts Imperador. O mapeamento do fundo do oceano começou durante o Ano Geofísico Internacional (1957-1958). Os núcleos do fundo do mar estabeleceram datas para as ilhas e montes submarinos. Subsequentemente, os mapas de relevo do fundo do mar publicados pela National Geographic do Índico (outubro de 1967), do Atlântico (junho de 1968) e do Pacífico (outubro de 1969), combinados em um mapa do fundo oceânico mundial (dezembro de 1981). O Atlas do Mundo do Times (7a. Ed., 1985) começou a rotular cordilheiras submarinas e cadeias de montes submarinos em seus mapas de superfície oceânica.

dos montes submarinos do Imperador em homenagem ao geólogo japonês que primeiro as identificou. Elas foram criadas ao longo de um período de 30 milhões de anos, somando-se à cadeia que corre no sentido noroeste, o arquipélago havaiano inteiro, com seus 106 vulcões, foi criado em um período de 70 milhões de anos. A mudança na direção indica que o movimento da placa do Pacífico foi quase diretamente em sentido norte, embora as causas desse movimento e da abrupta mudança de direção 50 milhões de anos atrás permaneçam um mistério. A resposta provavelmente deriva de mudanças na direção e de colisões em diversas outras placas adjacentes.

Essa narrativa da evolução do arquipélago havaiano é particularmente rica de detalhes. Os movimentos continentais são mais frequentemente ilustrados com mapas que mostram a divisão de Pangeia, com o movimento do fundo do mar como causa, a subducção ao redor das placas como efeito e os terremotos como corolários. A conjunção de movimentos de placas, erupções dos pontos quentes e a criação de cadeias de ilhas tem sido uma narrativa negligenciada e notavelmente omitida de apresentações de Macro História. Mas as dramáticas erupções do Kilauea destacam processos geológicos - algumas vezes catastróficos- que impactam o bem-estar humano.

De maneira mais ampla, a cadeia de montes submarinos do arquipélago havaiano destaca um processo geológico mais disseminado. Wilson (1963) fornece um rascunho do Pacífico mostrando seis linhas de ilhas e montes submarinos se movendo, grosso modo, na mesma direção que o arquipélago havaiano - essas cadeias incluem as bem conhecidas Marquesas e Samoa - todas aparentemente dirigidas pelo deslocamento do fundo oceânico abaixo da Subida do Pacífico Oriental, todas fornecendo evidência de pontos quentes. Para leste da Subida, duas outras cadeias com movimento em direção

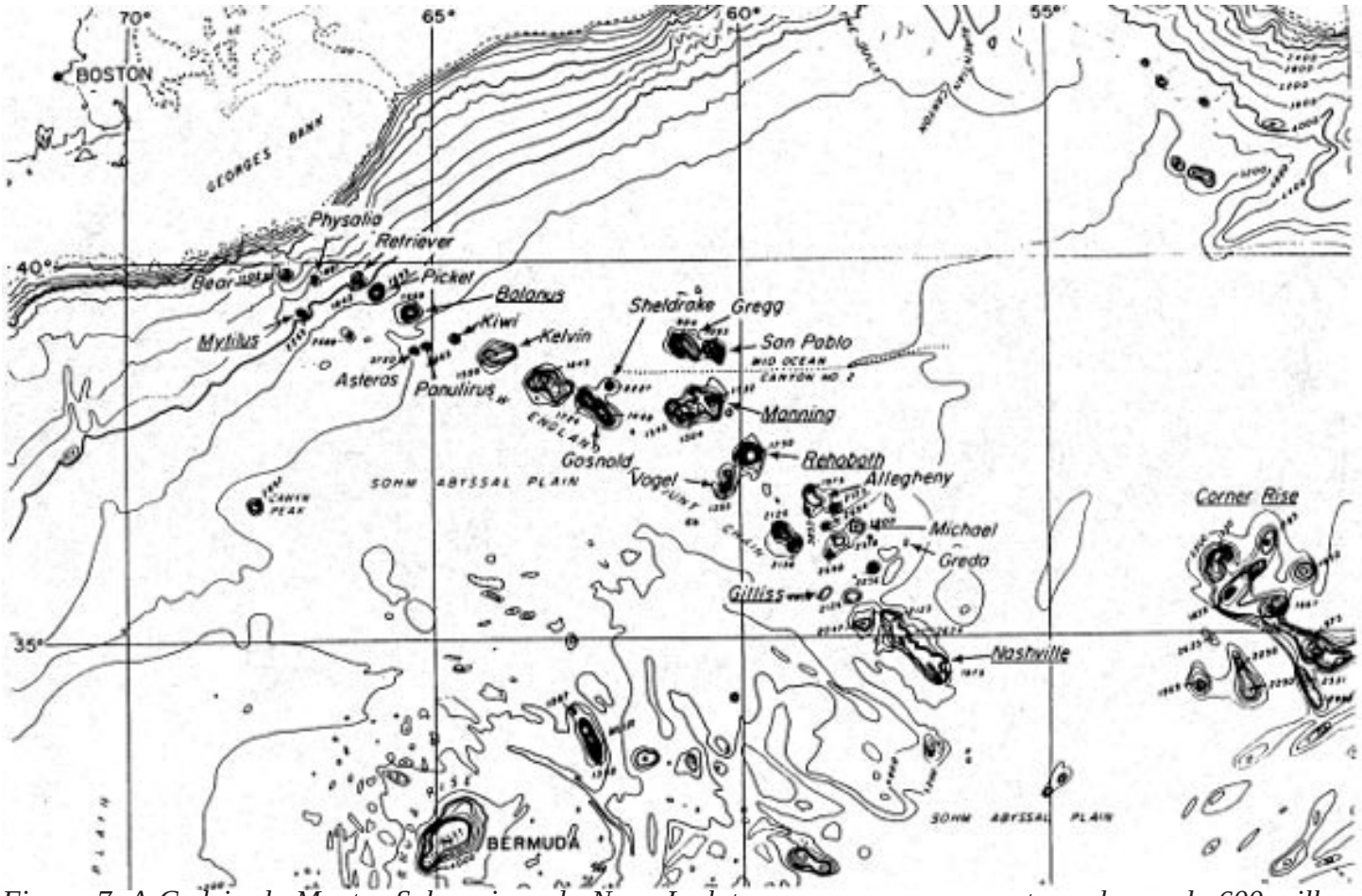

Figura 7. A Cadeia de Montes Submarinos da Nova Inglaterra corre para noroeste ao longo de 600 milhas, fornecendo um registro do movimento da placa norte-americana para longe da cordilheira Mid Atlantic. A criação de montes submarinos tem origem no ponto ótimo do Grande Meteor a nordeste das Bermudas. Imagem: De Baab (2005).

a Leste, indo rumo à América do Sul, são a Ilha da Páscoa e as Ilhas Galápagos.

Mais distantes, duas sequências de elevações no oceano Índico permanecem como traços de um rápido movimento em direção ao norte da placa Indiana após o rompimento de Pangeia. A sequência de montes Chagos-Laccadive, que inclui as Maldivas, segue por 2.500 km desde o ponto quente vulcânico de Reunião, que está ativo há 66 milhões de anos. A sequência de montes do Meridiano Noventa Leste correspondendo quase exatamente o 90º meridiano, segue para o norte por quase 5.000 km; as idades relativas, mais velhas ao norte, indica um ponto quente ativo na extremidade sul entre 82 e 43 milhões de anos atrás.

Qualquer discussão sobre pontos quentes e placas tectônicas inevitavelmente dirige a atenção para outros locais ao redor do mundo. A exploração do fundo do mar ao redor do planeta nos anos 1950 e 1960 levou à descoberta de dúzias de cadeias de ilhas e montes submarinos. Frequentemente elas são de pequeno interesse: podem subir algumas centenas de metros acima do fundo do mar, mas se seus picos estão a centenas de metros abaixo do nível do mar, sua importância fica restrita a riscos de navegação para submarinos. Na contramão dessa atividade pouco visível, a erupção atual do Kilauea apresenta uma visão

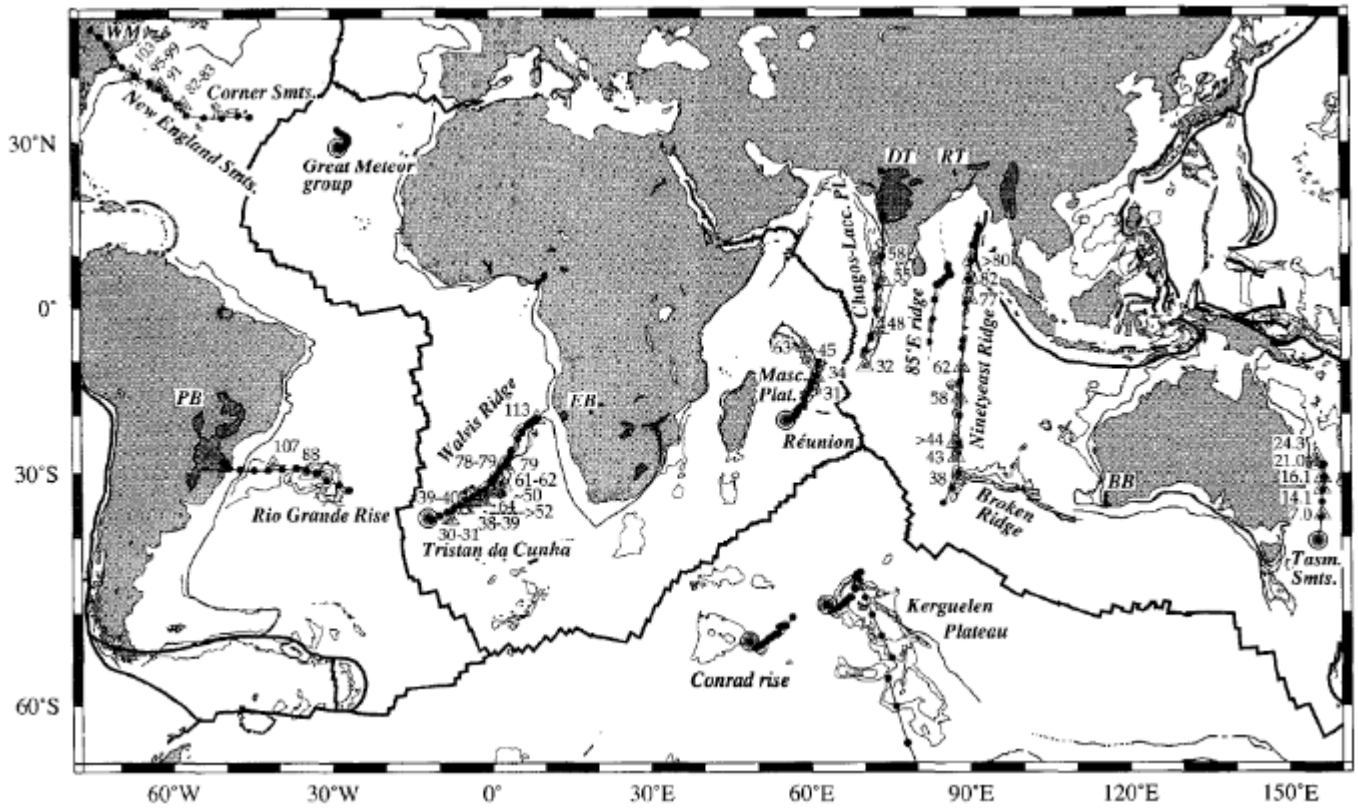

Figura 8. Principais faixas de pontos críticos nos oceanos Atlântico e Índico. Pontos sombreados marcam os locais atuais de pontos de acesso considerados presos no manto da Terra; faixas são pontilhadas em intervalos de 5 milhões de anos. Faixas no Atlântico revelam o movimento dos pratos da Terra longe das fronteiras das placas do meio do oceano, onde a lava do manto empurrando para cima está forçando as placas a se separarem. Pistas de corrida do norte do Oceano Índico e leste da Austrália registram o movimento da placa indiana da Pangéia em direção à Ásia de 180 a 200 milhões de anos atrás.
Fonte: Müller et al. Figure 1. Geology (March 1993).

dramática do surgimento de ilhas em uma ilha que já ultrapassa muitas em elevação e superfície. O fluxo de lava que se dirige lentamente para o mar esclarece um processo que expande pouco a pouco os limites da ilha e alarga sua fundação conforme novos fragmentos de basalto rolam seus declives submarinos.

Enquanto os rastros de pontos quentes são numerosos no oceano- talvez porque a crosta oceânica seja mais fina que a crosta continental - sua configuração e efeitos na população humana apontam para exemplos terrestres notáveis. Não estamos tão cientes desses porque a erosão destrói as chaminés e caldeiras em alguns milhões de anos. O ponto quente mais dramático do planeta está sob o Parque Nacional de Yellowstone, no noroeste de Wyoming. Sua última erupção foi há mais de 600 mil anos; sua caldeira foi tão erodida nesse ínterim que não foi reconhecida até que fotografias aéreas e radares capazes de penetrar o solo expuseram seus contornos. Seus sinais hoje são as atrações turísticas dos gêiseres, chaminés de enxofre e vapores tóxicos, mas os terremotos ocasionais nos lembram da pressão subterrânea de um imenso bolsão de magma que pode romper nos próximos milhares de anos. Ainda mais erodidas e detectáveis apenas com avançado escaneamento aéreo são as sete caldeiras que traçam uma linha ao longo da Planície do Rio Snake, do sul de Idaho até a divisa com Oregon- um registro

geológico de 15 milhões de anos de movimento de placas sobre o ponto quente de Yellowstone.

Lava basáltica de movimento lento é típica de erupções de pontos quentes anos de fluxo de lava no Kilauea fornecem uma adequada ilustração. Em contraste a isso, vulcões de subducção próximos às margens das placas tectônicas - caso típico do famoso Círculo de Fogo ao redor do Pacífico - tendem a erupções explosivas como a explosão de 1981 que derrubou metade do pico do Monte Santa Helena e a erupção do vulcão Mayon nas Filipinas em Janeiro de 2018. Aqui a água que desce com o fundo do mar em subducção vira vapor nas profundezas, o que fornece combustível para vulcões terrestres como as dúzias que seguem paralelas à costa na Califórnia, em Oregon, em Washington e na Colúmbia Britânica. Contudo, apesar da ansiedade na Ilha Grande, alimentada por uma sucessão de fendas e uma atividade contínua nos últimos 35 anos, o Kilauea parece menos propenso a explodir e mais disposto a continuar expelindo quilômetros de rios de lava lenta.

Enquanto esse drama continua, um novo está sendo ensaiado no camarim. A 32 km da costa sudeste da Ilha Grande, uma nova pluma térmica está trabalhando, provavelmente uma ramificação da chaminé principal do ponto quente. Um novo monte submarino, Lo'ihi, está lentamente subindo pelo flanco do Mauna Loa, um predecessor do Kilauea e o maior vulcão em escudo do mundo. A evidência sugere que Lo'ihi será a próxima ilha havaiana. Seu início está estimado em 400 mil anos atrás; a elevação já atinge 3.750 m acima do fundo do mar enquanto seu topo permanece a 975 m abaixo do nível do mar. Ela cobre uma área alongada de chão marinho com 12 por 25 km de dimensões, o que lhe dá o nome de Lo`ihi ("longo"); está crescendo com 90% da lava ejetada que desce por seu declive, progressivamente aumentando sua base. No atual ritmo de crescimento, a previsão é de que alcance a superfície do oceano em aproximadamente 50 mil anos, tempo no qual a Ilha Grande terá se deslocado mais 4,8 km para noroeste. Se Lo`ihi continuar a

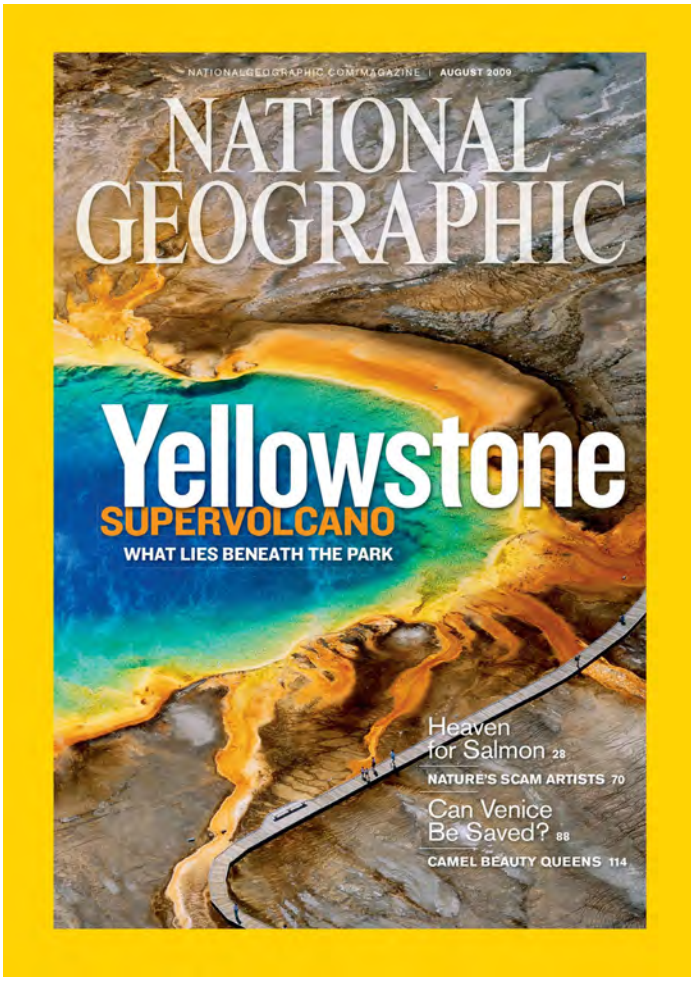

Figura 9. National Geographic Cover, Agosto de 2009. A conscientização do público sobre o supervulcão de Yellowstone remonta à imprensa popular e a vídeos como o episódio de Yellowstone na série History Channel, How the Earth has made, Primeira Temporada (2009).

aumentar de elevação e tamanho, poderá agregar um sétimo vulcão aos seis existentes na Ilha Grande, aumentando em muitos quilômetros sua área e costa.

Lo'ihi, que é o 107º vulcão no arquipélago do Havaí e do Imperador, foi tido primeiramente como um vulcão inativo, mas a atividade sísmica levou a seu reconhecimento como um monte submarino ativo em 1955. Por anos, foi estudado remotamente com câmeras submarinas e amostras extraídas de seu topo. O intervalo de tempo até a primeira descida a seu

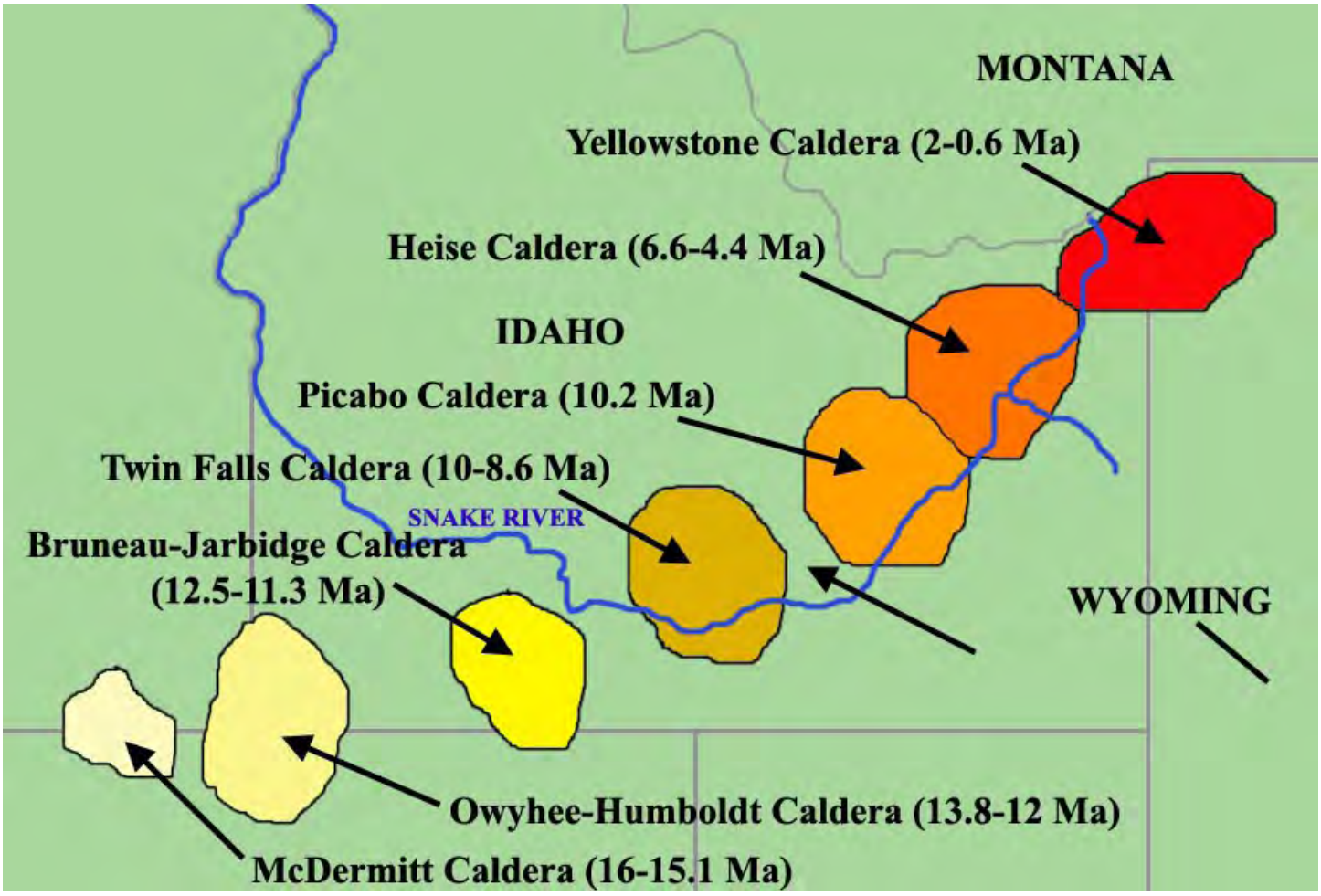

Figura 10. A trilha Hotspot do Snake River. Do Parque Nacional de Yellowstone, no canto noroeste de Wyoming, um movimento sudoeste da placa norte-americana sobre um ponto fixo (agora sob a Caldeira de Yellowstone) gerou uma linha de caldeiras pesadamente erodidas através da Planície do Rio Snake no sul de Idaho. O namoro indica erupções do McDermitt Caldera há 16 milhões de anos na fronteira entre Oregon e Nevada e o mais recente sob a Caldeira de Yellowstone há 600 mil anos.

Source: Diagram sketched from Branney (2007), Fig. 1.

cume em 1987 oferece um indicativo das dificuldades em exploraras profundezas oceânicas: nos 23 anos entre as datas, já havíamos posto pessoas no espaço, feito 7 pousos na lua e colocado 14 ônibus espaciais em órbita.

A lava expelida debaixo d'água esfria rapidamente, quebrando-se em pedregulhos e fragmentos irregulares conhecidos como tálus, não muito diferentes do material acumulado na base de uma encosta rochosa erodida. Os declives do Lo'ihi são majoritariamente construídos nessas bases, o resultado são os constantes deslizamentos detectados pelos sismógrafos. Terremotos são frequentes, instrumentos registram deslizamentos regularmente. Desde que os registros começaram em 1959, uma média de dois a dez terremotos por mês ocorreu perto do topo. Em 1996, sismógrafos registraram um total de 4.070 terremotos em um período de três semanas, um recorde para qualquer vulcão havaiano. O resultado foram mudanças substanciais: uma cratera de 1 km de diâmetro e 300 m de profundidade se formou no meio

dos detritos, juntamente com o colapso da "Chaminé de Pele" - nomeada em honra à deusa havaiana dos vulcões - que era tida como estável. A cratera foi então renomeada como "Poço de Pele"

As condições ao redor das chaminés no topo de Lo'ihi são tóxicas. A temperatura da água fica em média a 90º Celsius (196º Fahrenheit), as temperaturas de suas ejeções chegaram a 250º Celsius. Não há oxigênio na água; os níveis de dióxido de carbono e de compostos de ferro são altos. O monte submarino é caracterizado por numerosas chaminés hidrotermais, tanto no topo quanto nos flancos, ao redor das quais micróbios não oxidantes prosperam. Elas se parecem com comunidades microbióticas ao redor das fumarolas negras ao longo das dorsais oceânicas agora consideradas como a provável localização das primeiras formas de vida. Mais ao longo dos flancos, onde a toxicidade é mínima, várias espécies de invertebrados e peixes foram catalogadas.

Uma apresentação das origens do Havaí em um curso de Macro História oferece uma incisiva introdução sobre a tectônica de placas, os pontos quentes e sua presença no mundo inteiro, juntamente com a exploração de uma das mais ricas regiões da Terra. O vídeo *Wild Hawaii* oferece uma investigação espetacular tanto das ilhas quanto do mundo dos montes submarinos. O reconhecimento da importância dos montes submarinos é evidente na criação de um parque dedicado a eles pelo presidente George W. Bush, parque que foi expandido em 800.000 km² pelo presidente Barack Obama, constituindo uma das maiores reservas submarinas do planeta.

A menção à Chaminé de Pele e ao Poço de Pele

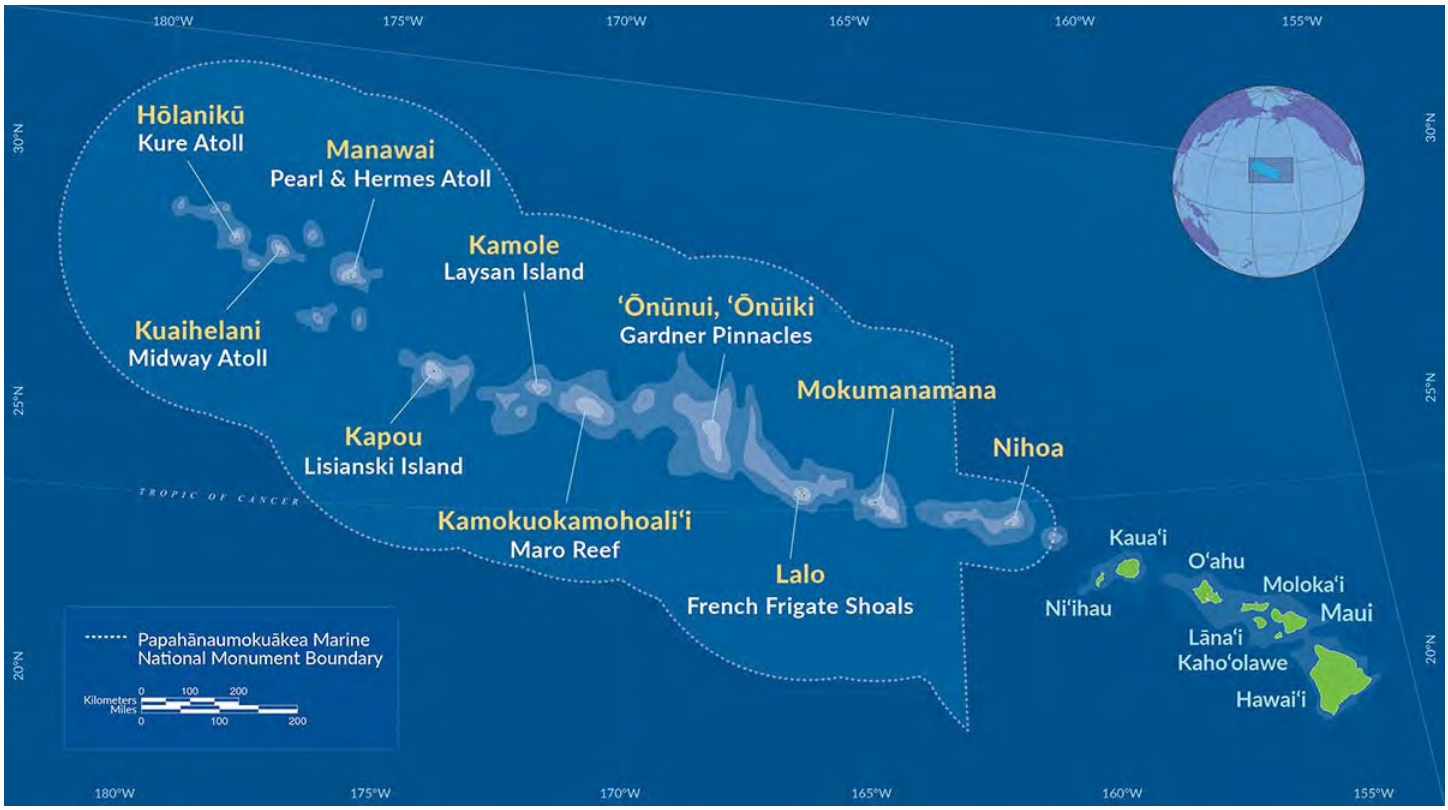

Figura 11. Papahānaumokuākea. Este Monumento Nacional Marinho, criado pelo presidente George W. Bush e ampliado pelo presidente Barack Obama, se estende pelo extremo oeste de Ko Hawai'I Pae Āina (o arquipélago havaiano).

introduz outra dimensão da história havaiana. Os migrantes colonizadores que vieram das ilhas do Sul e chegaram nas ilhas havaianas entre 1.500 e 1.200 anos atrás importaram uma mitologia que evoluiu com seu novo ambiente. Em uma surpreendente correlação entre o real e o imaginário, diz-se que Pele assentou-se primeiro em Ni'ihau, a mais antiga das ilhas havaianas, depois migrou para o sudeste, para a mais nova das ilhas, a Ilha Grande, onde ela reside atualmente Parece que ela sempre esteve presente onde as ilhas vulcânicas estavam sendo criadas. Mas, enquanto Pele é considerada como residente nas chaminés do Monte Kilauea, a Chaminé de Pele, que entrou em colapso e transformou-se no Poço de Pele, sugere que ela talvez faça visitas periódicas ao Lo`ihi.

Na minha versão da Macro História - na disciplina de Narrativas Cósmicas da Universidade de Houston - eu me refiro às histórias míticas como "narrativas cósmicas arcaicas", o que define a mudança de narrativas de origem pré-científicas para as narrativas de origem científicas como uma evolução e não uma negação. A mitologia que cerca Pele é facilmente descoberta na obra de Martha Warren Beckwith, Mitologia Havaiana (1982) mas é dramaticamente ilustrada pelo artista havaiano Herb Kawanui Kane em Pele: Deusa dos Vulcões do Havaí (1987). O livro de Kane encontra-se esgotado, embora meus alunos sejam capazes de encontrá-lo em sebos ou na biblioteca da Universidade de Houston.

As pinturas de Kane capturam, como nenhuma outra, a união entre a geologia e a narrativa mítica; os originais, agora vistos como as obras de arte mais importantes do Havaí, estão guardadas no Bishop Museum, em Honolulu; sete das pinturas de Kane, encomendadas pela National Geographic, sem dúvida resultado da recente incorporação do Havaí como o mais novo estado americano apareceram na edição de dezembro de 1974.

Como um colecionador de estátuas de deuses e deusas encontradas na China, na Malásia, em Singapura e na Tailândia, eu estava interessado em localizar uma escultura de Pele. Ao falar com diversos residentes e lojistas em Honolulu, descobri que estátuas da deusa parecem não existir: na verdade, fui informado que a própria Pele ficaria irritada se alguém tentasse criar tal artefato. O que apareceu nas conversas foram narrativas pessoais com um tema comum, a influência vingativa de Pele sobre aqueles que a ofenderam. Turistas que levaram pedaços de lava do Havaí frequentemente foram vítimas de má sorte, mesmo de alguns desastres pessoais. Avisados por residentes locais que Pele buscaria vingança por esse saque a seu território, não era incomum para antigos turistas enviarem de volta seus souvenires vulcânicos na esperança de fazer as pazes com Pele e restaurar a normalidade de suas vidas.

Em retrospectiva, talvez eu esteja melhor sem uma estátua de Pele.

Figure 12. Pele Rejoicing. A painting by Hawaiian artist Wallace Kong captures Pele as the benign goddess of the Hawaiian land and people, unperturbed by the background of an eruption-lit sky and towering volcanic dust clouds.

Image used by permission.

Acknowledgements
Sempre que possível, mapas e imagens são de agências de notícias de acesso aberto ou sites do governo. A imagem protegida por direitos autorais de Wallace Kong, Pele Rejoicing (Fig. 12), é usada com permissão. Um agradecimento especial deve-se à ololog ista-geóloga Olga Garcia-Moreno por uma leitura perceptiva, referências úteis e edição cuidadosa. Toda tentativa foi feita para localizar as primeiras fontes de direitos autorais para ilustrações, mapas e outras imagens.

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Endnotes

1 Agência Federal de Gestão de Emergências (Federal Emergency Management Agency no original em inglês) – órgão norte-americano responsável por organizar a resposta a desastres naturais

2 No original, 3.600 milhas. Todas as unidades relevantes foram convertidas para o Sistema Internacional de Medidas.

3 Geodetic Survey é uma agência federal norte-americana responsável pelo mapeamento das coordenadas dos EUA. Desde 1970 faz parte do Departamento de Comércio dos EUA.

Towards a Big History Model for Italian Schools: The Convergence of Knowledge from Many Disciplines

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Abstract

To quote the psychologist Jerome Bruner, "Schooling is only one small part of how culture inducts the young into its canonical ways." This "small part" has become much smaller in recent decades. In fact, scholastic curriculum has embraced only a small part of the enormous and complex changes that scientific and technological research has generated in everyday life and in the way people view the world. A new culture is now spreading through a multiplicity of media forms that scholastic institutions have struggled to catch on to and understand. The formation of global citizens is an emerging problem. OPPI is a small teacher training institute that for more than 50 years, in cooperation with schools and universities, has been keeping teachers aware that technological innovations are changing people's consciousness and that education must adapt to these changes. OPPI has identified Big History as an important means to adapt scholastic instruction to youths' consciousness and has begun to study how to implement it. Its activities begin with a questionnaire investigating the spontaneous ideas that students have acquired about the universe, not only from previous school studies, but also from social networks, the media, and their family environment. Discussion of this questionnaire is the main topic of this article. The second topic concerns the presentation of an intervention model, which is planned for students ages 16–18 and their teachers.

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Introduction

Scientific and technological advances have been able to curb, in much of the world, problems that have weighed heavily on human life up until the last century: famine, epidemics, lawlessness, and our relationship with death (Harari 2015). Yet the people who benefit most from this new condition are increasingly concerned about their future, and many consider the networked world produced by the development of sciences and technologies to be a danger. Indeed, the speed of this development is completely new in human history. By the middle of the century, a meticulous study of the technological advances in the history of mankind had already been published (Lilley 1946). The author examined the tools used by humankind. By the Old Stone Age they were equipped with "axes, knives, saws, spokeshaves, and scrapers of chipped stone, mallets, awls and piercing tools, needles of ivory, spears and harpoons. They also had tools for making tools." He notes that in the "Mesolithic (Middle Stone)" Age they used adzes, gouges, and chisels to produce canoes and paddles. Lilley thus retraces the long path of inventions up to his day, assigning each a score based on their social impact. Thus he constructs a curve that he calls the "relative invention rate index," shown in figure 1.

This quantitatively documents the enormous growth of inventions that began with the industrial revolution. It is interesting to note that in 1966 Lilley edited a second edition of his book, casting doubt on a

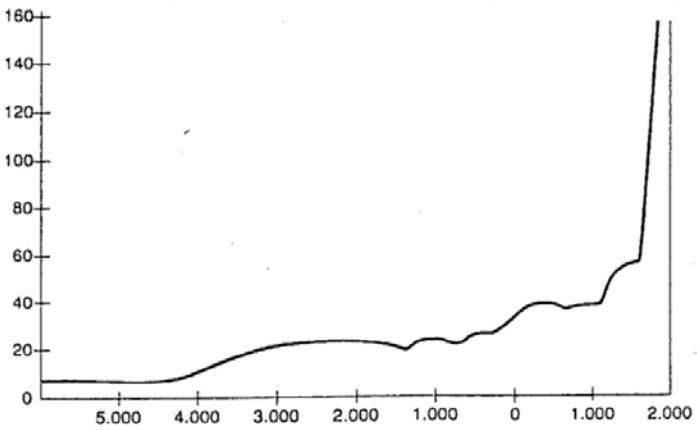

Fig. 1: Lilley's relative invention rate index

quantitative analysis of the innovations: "The extension of my relative invention rate index to the post-war period would have presented formidable difficulties"! In those same years, to understand Lilley's difficulties, innovations and amazing discoveries took place one after the other and touched every field of knowledge: in 1953, Rosalind Franklin, James Watson, Francis Crick, and Maurice Wilkins had discovered DNA, and all the consequences of that discovery were developing; in 1957, M. and G. Burbidge, William Fowler, and Fred Hoyle had documented the role of stars in the formation of all the atoms in the Mendeleev table; in 1962, Harry Hess had formulated the theory of Sea Floor Spreading, and in 1965 Tuzo Wilson's discoveries about transform faults and hot spots had led to the birth of Plate Tectonics. In 1969, a few years after the publication of the second edition of Lilley's book, Neil Armstrong and Buzz Aldrin would set foot on the moon, and in 1971, Ted Hoff, Federico Faggi, and Stan Mazor would build the first microprocessor. Conditions were being created that

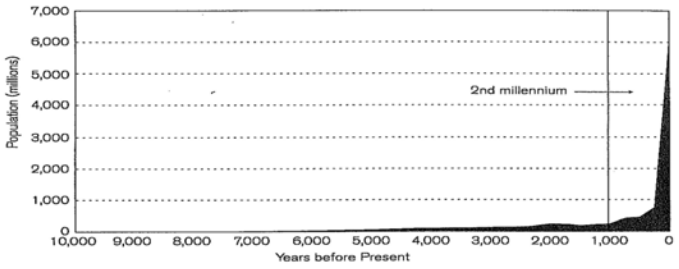

Fig. 2: Christian 2005, 209

would lead Lilley's index of inventions, if calculated, to enormous values, growing exponentially year after year. It's not surprising that this index resembles, down to the details, the population, shown in figure 2.

The link between technological development and population growth has been extensively studied since Lilley's time (Meadow 1973), and we know that the "rapid and sustained population growth must imply an acceleration in rates of innovation" (Christian 2005, 352). Let us now examine the equally new and dramatic problems that technological development poses to institutions and especially to those dedicated to the reproduction of knowledge.

For some time we have been aware that the devices invented by humankind in their history, from the axe to the mobile phone, are prostheses for human organs that modify their skills and perceptions (McLuhan 1964). Just as traditional prostheses replace diseased body parts, all the devices available to humans weaken the organs that they amplify. Mechanical tools weaken the use of muscular strength; calculators, calculation skills; media, personal relationships. The devices that increasingly crowd the human environment then change the behaviors that characterize social life. The collective consciousness (that is, the set of representations, norms, and values shared by the members of a society) also changes as the tools, the machines, and the available media change. Institutions are adapting to the evolution of the collective consciousness with a growing delay. This problem is emerging strongly in all institutions, including scholastic ones (Reguzzoni 2010). Assuming that the complexity of social institutions grows like the invention index, one could make a mathematical model that measures the delay with which institutions adapt to the changes brought about by new inventions. One could thus calculate the evolution of the distance between social institutions and the collective consciousness over time. However, today an extrapolation from Lilley's curve, whose last significant point refers to 1943 (atomic energy), would probably be arbitrary. For us it is enough to know that, considering the exponential trend of this evolution,

the delay with which institutions adapt to the changes brought about by technological development grows year after year with respect to the material needs and to the consciousness of contemporary humankind. In the globalized world, we see every day the inadequacy of countries founded on the concept of nation affirmed at the time of the French revolution. The institutions built on this concept have increasing difficulties adapting to new needs such as mobility or satisfying old ones such as social safety. More generally they fail to address and manage global problems such as climate change.

We will limit our discussion to educational institutions, to places where in modern times young people are taught to share information and symbols and practice collective learning, "so the knowledge and skills can accumulate non-genetically from generation to generation, and each individual has access to the stored knowledge of many previous generations" (Christian 2004, 146). In a globalized world, educational institutions face the challenge of the iceberg of cultures (Katan 1999, 29) and the global ICT (information and communication technologies) network. Collective learning is a fundamental characteristic of our species, and our survival relies on its effectiveness. There is an enormous imbalance between investments in communication technologies and investments in making sure that all young people, not only the elite, are able to use those technologies consciously. The disinterest displayed by governments as well as the public in this imbalance is truly concerning. "Ultimately, despite a rapid growth in education and Internet access for much of the world, most people on our planet are still disconnected from global platforms of knowledge sharing. Even amongst those two billion that are now online, a significant proportion of those that are connected are still left out of global networks, debates and conversations. Digital divisions cannot be simply bridged through connections and open platforms, and much more work needs to be done to overcome inequalities in visibility, voice and power in an increasingly networked world. In other words, while connectivity is clearly a pre-requisite for participation in 21st century platforms of knowledge sharing and participation, connectivity and access are by no means a determinant of knowledge access, creation and sharing" (Graham 2014). In schools, the informed use of ICT requires interdisciplinary approaches that challenge the traditional forms of scholastic transmission of knowledge. "In education the conventional division of the curriculum into subjects is already as outdated as the medieval trivium and quadrivium after the Renaissance. Any subject taken in depth at once relates to other subjects. Arithmetic in grade three or nine, when taught in terms of number theory, symbolic logic, and cultural history, ceases to be mere practice in problems. Continued in their present patterns of fragmented unrelation, our school curricula will insure a citizenry unable to understand the cybernated world in which they live" (McLuhan 1964, 347). For more than 50 years there has been awareness of the inadequacy of school curricula for the consciousness of the younger generation, and for some time educational research has made significant indications of renewal (Bruner 1960, 1996; Morin 1999). They should have been implemented some time ago, but the widespread lack of interest in this problem has not allowed for the formulation of projects of adequate scale. The indications of renewal are collected and tested only locally when favorable circumstances are achieved. Overall, educational institutions are losing the role of the integration and reworking of cultures gained from distant generations with those of recent generations. These are chaotically transmitted through the multiplicity of media, and young people try to interpret them more often than not without the help of the school system. Uncertainty and worries about the future, which in the countries most benefiting from technological innovations also manifest themselves politically, can also be attributed to the inability of the educational institutions to culturally prepare young people to understand and use them consciously.

Big History for an Agenda of Global Citizenship

To help schools adapt to the cultural changes brought about by academic and industrial research, OPPI, as a teacher training organization, plays a role as an interface between research and teaching (Codetta and Peroni 1998). In this role, they identified the Big History movement as a very important resource for promoting innovation in schools. "Big History can be the basis for a new understanding in today's global era, where change is exceptionally fast. Such macro studies can help solve global problems by supplying information for an agenda of global citizenship" (Kim 2016, 31). This new form of citizenship is promoted by sharing with young people the global networks through which the transmission of much knowledge is carried out chaotically today. If schools were able to recognize and appreciate the role of many forms of media, they could focus only partly on the direct transmission of knowledge. They could become the center of a reworking of and critical reflection on the direction taken by new educational agencies. This is a completely new undertaking for teachers who are used to offering students courses of study within individual subject matters. They do not care how much students learn outside school; in fact, they often consider it a hindrance to their studies. Instead, today it is necessary to start scholastic studies of the most important topics with surveys on knowledge, beliefs, and ideas acquired by the students through institutions outside the school, through daily life, and through the family. These constitute the starting point for critically reorganizing this knowledge and setting the premise for further elaboration. This activity is also important because some ideas and beliefs may conflict with what is canonically taught in school, and this cannot be ignored. Over many years, OPPI has developed an appropriate questionnaire for this purpose. The general form of the questionnaire has been based on the idea that humans have a plurality of intelligences (Gardner 1986): people use a mix of different kinds of intelligence, generally epitomizing only one particular form. We organized a questionnaire to meet our goals, involving the area of feelings and emotions of the interviewee and their consciousness about their own feelings and emotions; space and interpersonal intelligence should be also involved. Questionnaires of this type have been used with students of all school levels, from grades 6 to 12, to investigate the ideas they had spontaneously acquired on many subjects before they were studied at school (Cappucci 2001). Like every living being, we too form spontaneous representations of the universe in which we live. The conflicts between these representations and those developed by the scientific community are part of our history. With the exponential growth of the technological innovations discussed in the introduction, these representations are now fed and

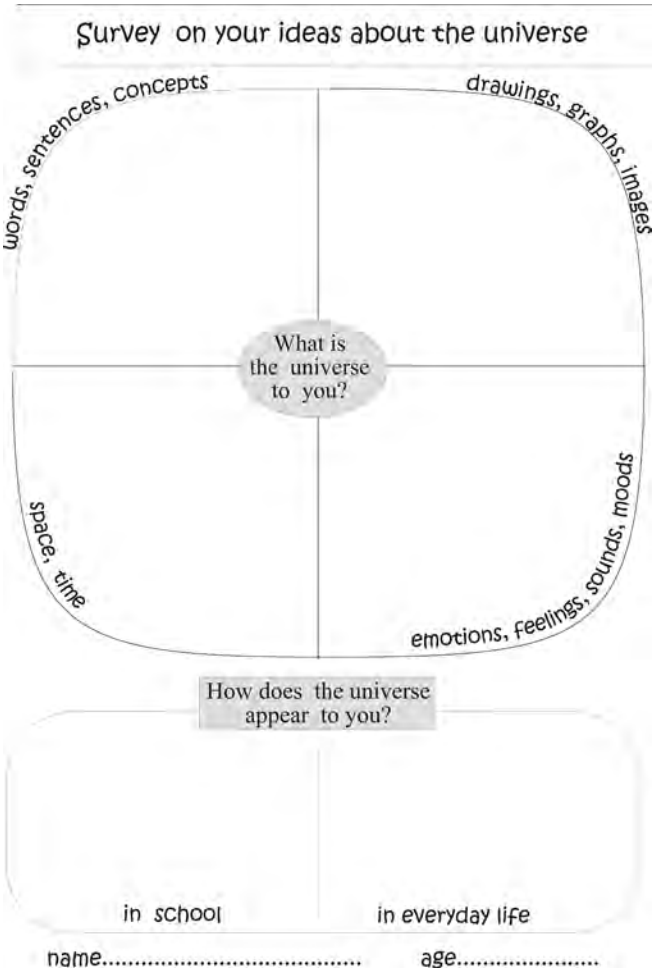

Fig. 3: The questionnaire

enriched by a huge variety of messages and stimuli that cross all forms of media. The questionnaire already used in the past to learn the spontaneous ideas of students on important concepts such as zero, lends itself very well to starting a Big History course of study. The questionnaire shown in figure 3 is the latest version of the questionnaires of this type tested in the last three years.

The students' answers shown in figure 4 are very different and indicate not only the cognitive and expressive skills and styles, but also the students' social environment.

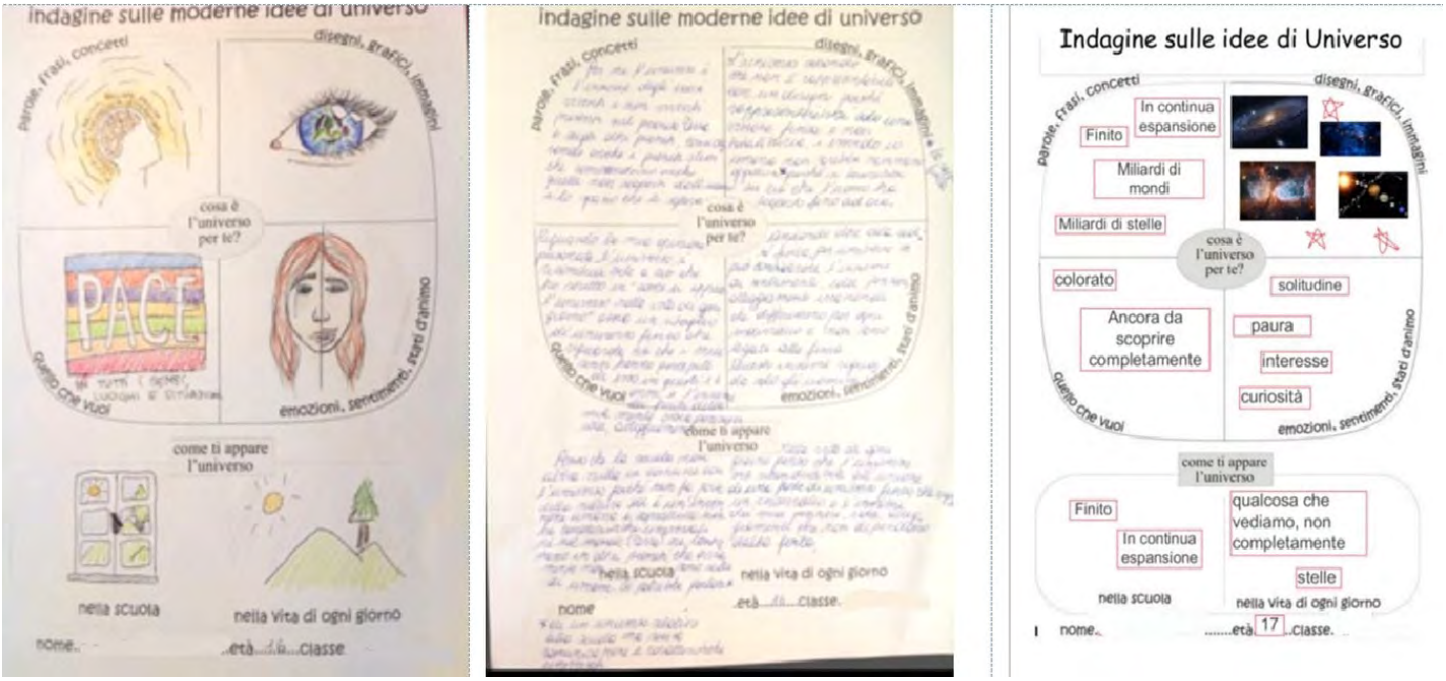

Fig. 4: The great variety of responses reflects the variety and complexity of intelligences.

Many responses (figure 5) refer to stereotypical representations, others reproduce images from telescopes, others are personal elaborations.

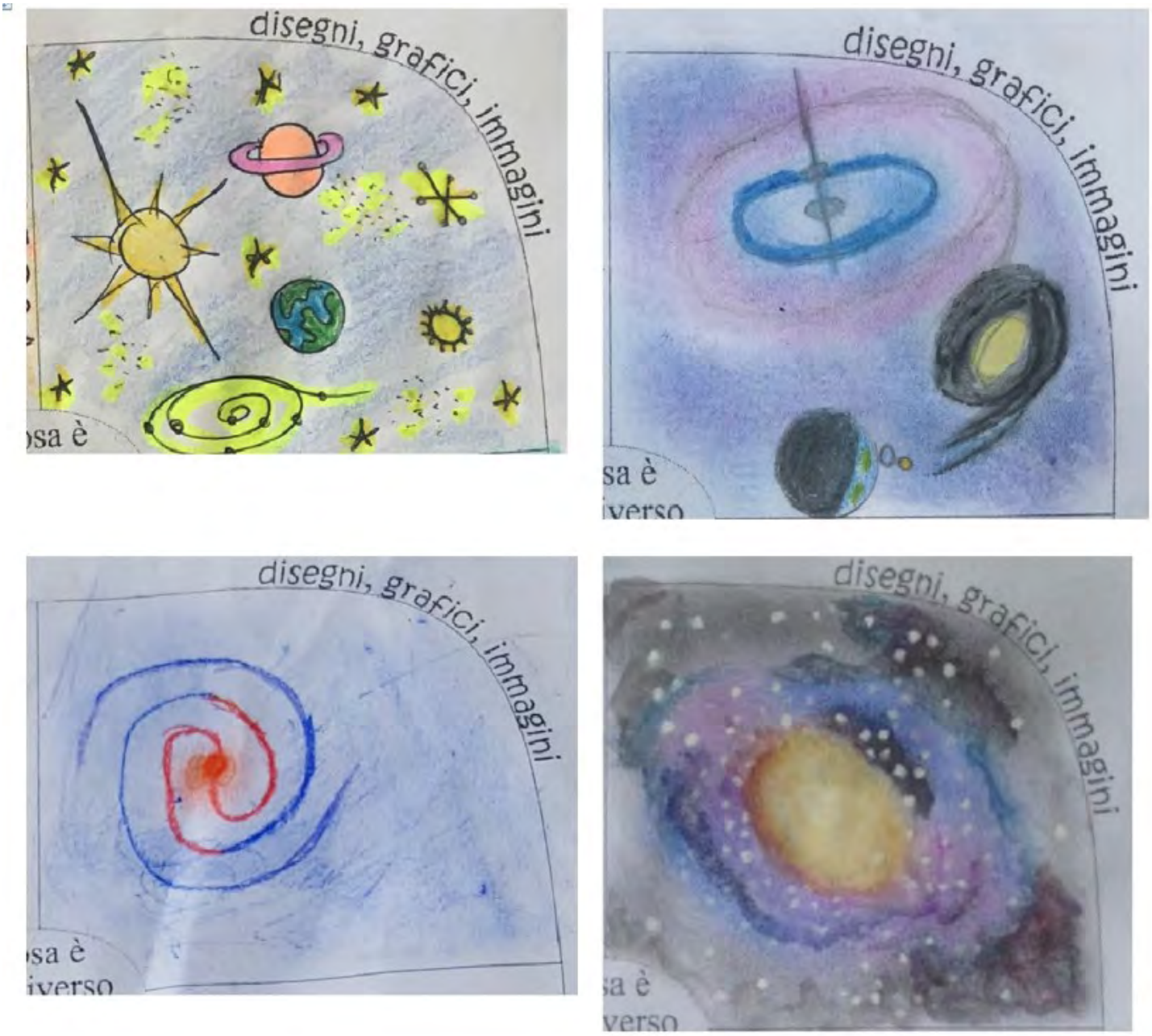

Fig. 5: Frequent representations of the universe

In the answers there are references to symbols, as in figure 6.

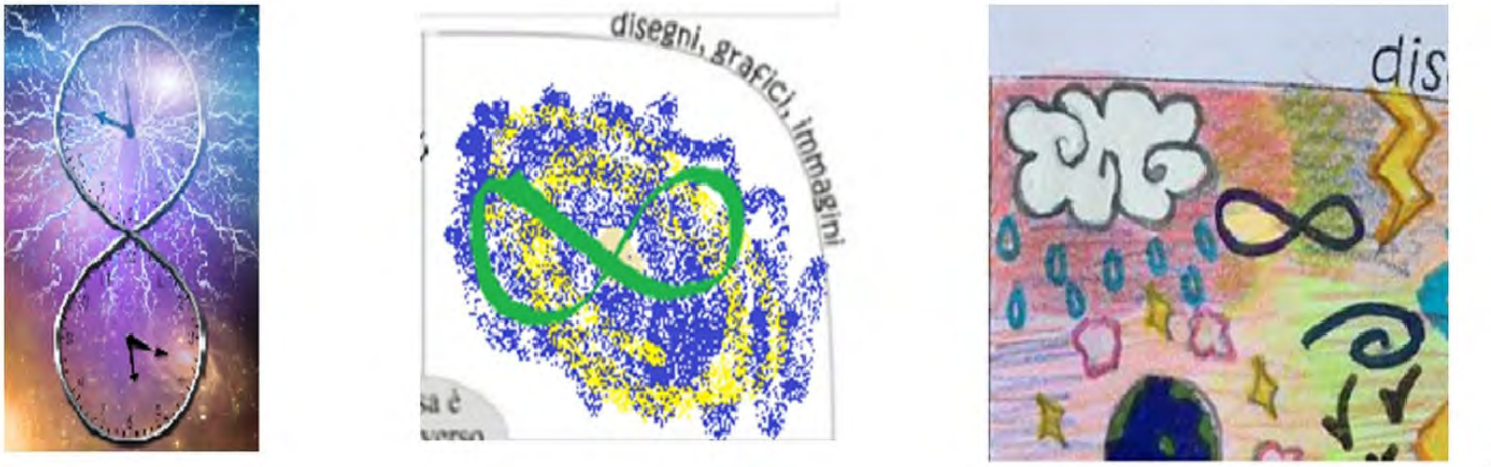

Fig. 6: Infinity as a symbol for the universe

The answers that try to express a position in respect to the universe are very interesting (figure 7).

Fig. 7: Our position in the universe

The universe is inside and outside of us, as in figure 8.

Fig. 8: The universe appears distant, or in our eyes, or all that is around us.

The questionnaire also investigates the universe/school relationship (figures 9, 10).

Fig. 9: Student as an observer or spectator but also a prisoner

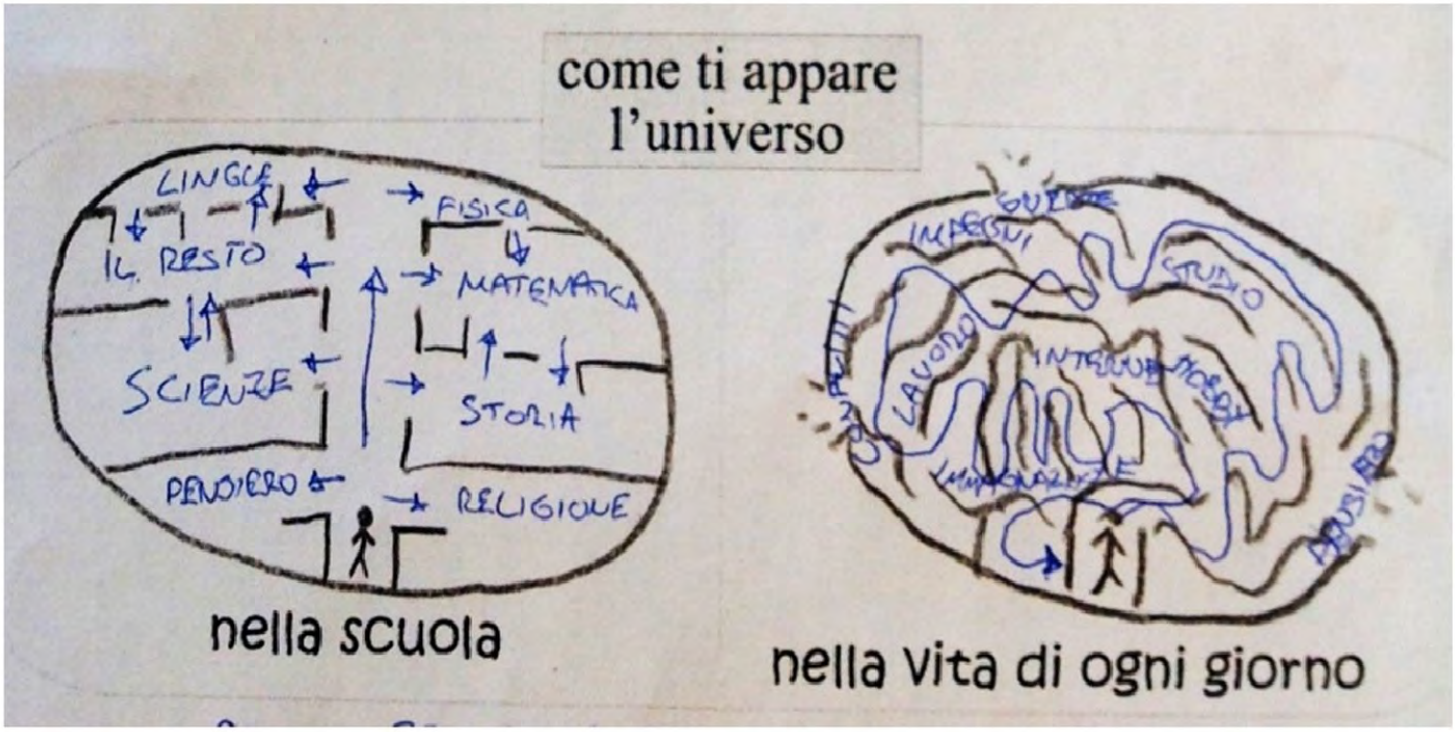

Fig. 10: The limits of fragmented studies

It could be useful to use the questionnaire to compare with other cultures and other educational traditions. Is the organizational rigidity and the fragmentation of knowledge that emerge from many only found in Italian schools?

The analysis of the answers offers a wide variety of interpretations with psychological tools as well. This variety is well suited to gathering the complexity of the topic in relation to students' perceptions. After completing the questionnaire, they are invited to rework them and to construct, starting from the key words they use, a conceptual map representing their ideas about universe (figure 11).

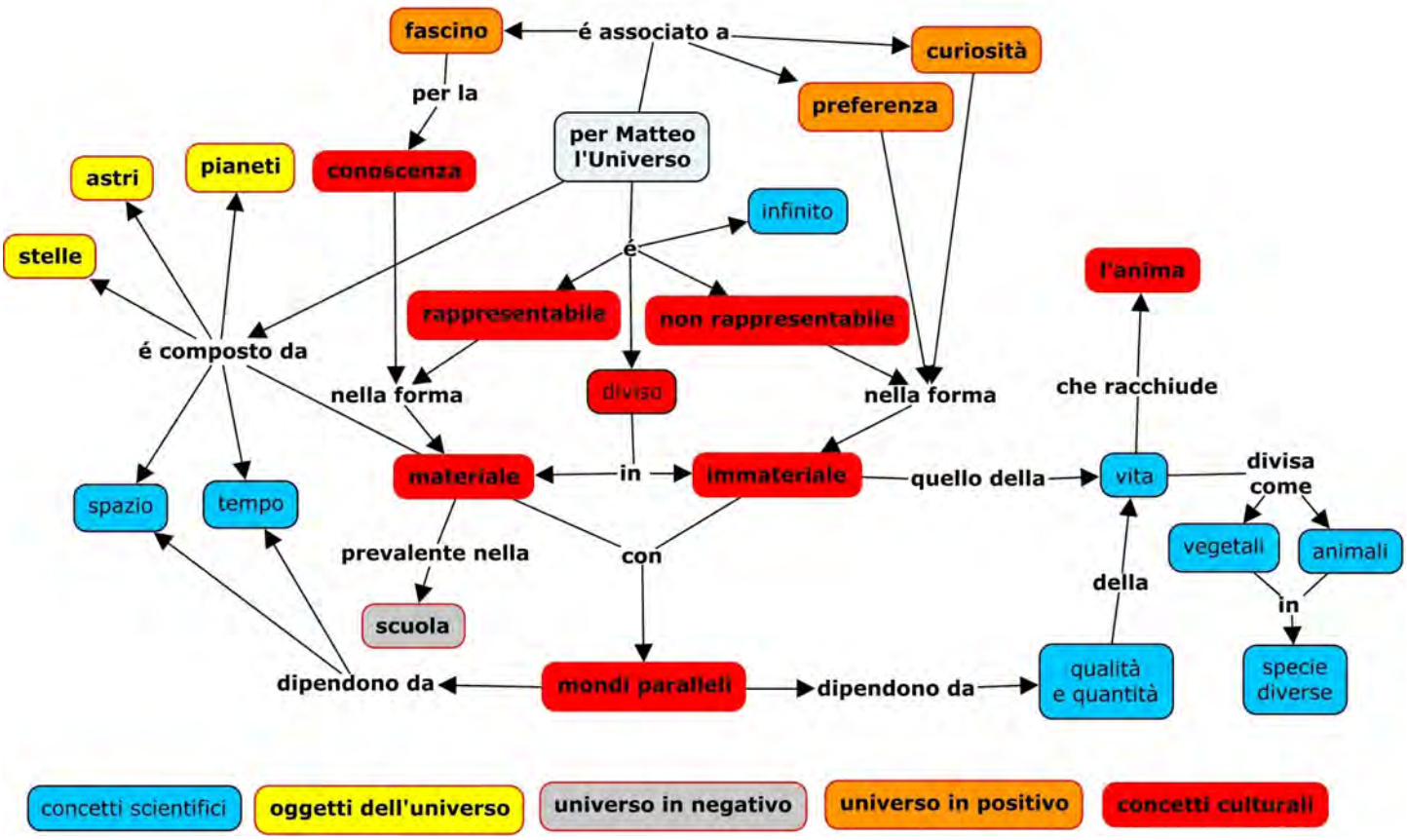

Fig. 11: The map of a student's idea about the Universe written at the beginning of a Big History class

Figure 12: Greater prominence is given to words that appear more frequently in the questionnaires.

Conceptual maps are used to represent their previously held knowledge about the universe. In fact, the constructivist approach (Novak 1984) shows how using conceptual maps leads to a reflection on learning and helps its consolidation. These reflections can start with a comparison between the words used by each student and the words that were used most by all the interviewees (figure 12).

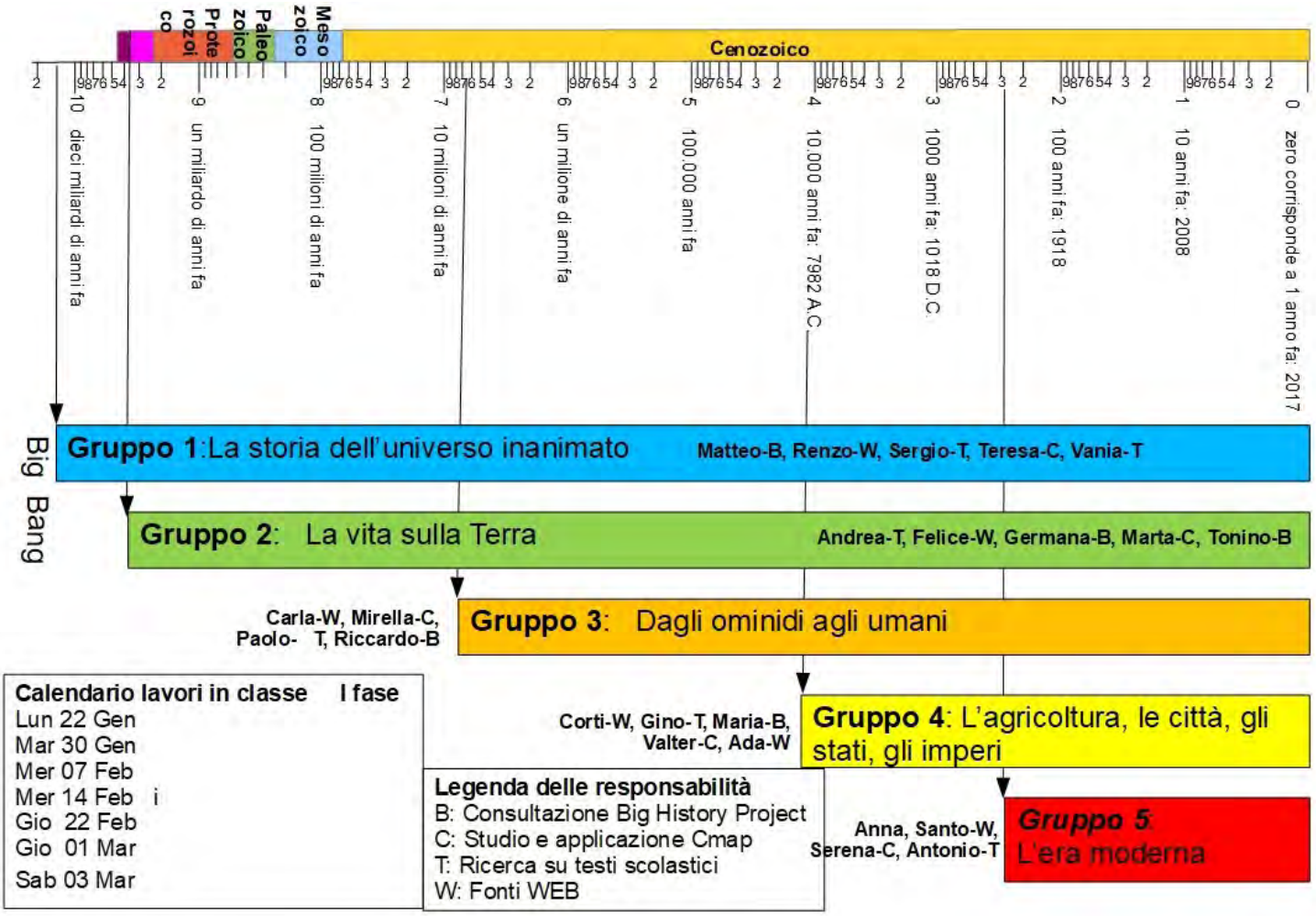

Fig. 13: Organization and planning of the activities

These maps are used to form five groups with similar interests. Each group is assigned a threshold of complexity in the history of the universe: the origins of the universe, the formation of the solar system, life, humans, and modernity. As can be seen from figure 13, the logarithmic scale of time is a guiding tool for locating and interpreting events and jumps of complexity in the history of the universe. The jumps of complexity "can only emerge when the circumstances are right. This includes, in the first place, the availability of suitable building blocks and energy flows and, in the second place, a great many limiting conditions such as temperatures, pressures and radiation. Complexity cannot emerge, or is destroyed, when the circumstances are not right" (Spier 2010, 36).

The groups study the assigned themes using many resources: teachers' lessons, textbooks, web resources, and especially online lessons from the public course the "Big History Project." The English subtitles that are provided for each lesson were a great help in overcoming the language barrier and encouraged a deeper comprehension. In the model that has been perfected in the past years working with more classes between the ages of 16 and 17, students work in groups two hours a week, assisted by a different teacher from the same class board. The involvement of teachers of all subjects is very important so that the

activities that the students perform in their study of Big History are recognized and appreciated in the final course evaluations of each student. This involvement takes place at the beginning of the activities, through meetings of experienced tutors of Big History with the teachers. The tutors present the main content elaborated by the Big History movement to them, highlighting that in the school curriculum, this content is presented to the students separately at different times and with different aims. They can be tied back together, connecting to each other in order to construct a unitary vision of the history of the universe and of man in it. The tutors then open a discussion with the teachers on the contributions that each subject can give to this vision. Even literature teachers can be involved by identifying "concepts from each of the nine Big History thresholds. Selected works of literature, including plays, poetry, short stories, essays, and novels, are used to exemplify and re-examine these concepts" (Rogoff 2014, 5–6). The students work two hours a week for about twenty hours, followed by their teachers in the classroom and by the tutors remotely through an e-learning platform. They refer to the action research methods (Elliot 1991) in governing the cooperative relationships between tutors, teachers, and students, always keeping in mind that each of the three groups has different motivations and objectives. At the end of this first phase, the groups are mixed using the Jigsaw method, which promotes "autonomy, competence, and social relatedness as posited by self-determination theory of learning" (Hänze 2007). Thus new working groups are formed in which all the knowledge about the history of the universe accrued in the previous phase is present. These groups, with the same schedule and organization as the first phase, must create a product that illustrates the vision of the universe reached through the study of Big History. During the process, the care and thought that the students put into choosing the media with which to share their acquired vision was striking. They produced, or at least designed, documentaries, video clips, e-books, comics, murals, computer applications, and even songs, although essays and conceptual maps were also proposed. Their works were evaluated for the conscious and justified inclusion of the content belonging to the subjects of the school curriculum. In this sense, students are encouraged to find, with the help of their teachers, a convergence of the subjects studied.

In the following year the activity continues with the study of a geographic territory through the lens of Big History. The work is planned following the approach of Little Big History (Quaedeker 2015), which, through the application of the Big History threshold concepts to a specific territory, allows students to bridge the gap between the large scale and universal concepts of Big History and everyday life experiences. Earth sciences are the core of the Little Big History second-year work as they share with Big History a time scale that spans billions of years. The geologic evolution of a territory is also the starting point to study the most recent Big History thresholds, related to human biological and cultural evolution, up to the present day modernity threshold, as "civilization exists by geological consent, subject to change without notice" (Durant 1946).

Each group of students receives the task of studying a specific time span in the history of the selected territory, with time intervals based on a ten-based logarithmic scale. The geologic time and space evolution of the area works as the common thread for the work and facilitates connections between groups.

A pilot test for the second-year approach was focused on Ossola Valley in the Italian Alps, as the complex history of this mountain range offers the best opportunities for diverse applications of Big History. This valley is one of the longest within the Alps and hosts a great geodiversity, which offers the best conditions for the project. In particular, Ossola was chosen because of the following advantages:

- It crosses the entire southern side of the Alps and offers a perfect cross section of the geologic history that led to the formation of this range.

- It hosts several outcrops of rocks much older than the Alps, covering the last 400 million years of Earth's evolution.

- It was profoundly shaped by glaciers during the last glacial eras, providing a framework on the scale of hundreds of thousands of years.

- It hosts important archeological sites showing the relationships between man and the geologic and geomorphologic evolution on the scale of thousands of years.

- It has been a major quarrying and mining site since the Middle Ages, providing a framework on the scale of hundreds of years till the present.

- It hosts a UNESCO Global Geopark, providing a framework of environmental protection on the scale of years to decades.

Two other specific aspects of Ossola Valley are an important plus for the application of Big History. Firstly, Candoglia and other minor quarries in the valley are the places from which marble was taken for the construction of the renowned Milan Cathedral and other monuments, thus providing an important link with history and the arts. Secondly, the valley is crossed by the "Frontiera Nord," a fortified line built at the beginning of the twentieth century as a defensive system with the beginning of World War I in sight.

The pragmatic approach to the second-year work is enhanced by a preliminary guided excursion to the selected Little Big History area focused on the close relationship between geological, biological, and cultural evolution and thresholds.

The result of the second-year work is the creation, by collaborative work among groups, of a conceptual model of the complex space- and time-based network of relationships that permeates the studied territory. Thresholds fade into a more comprehensive view that enables students to read the territory with modern eyes where geological, biological, and cultural aspects are closely interrelated. As factual evidence of the newly acquired competence, students elaborate a final product (a smartphone app in the pilot study on the Ossola Valley) for the dissemination and divulgation of their work.

The Model

In Italy there are many attempts underway to adapt educational institutions to the changes in the collective consciousness brought about by the evolution of knowledge and technology. They are fragmented but widespread, relying on the initiative of individual teachers. Among these, the experiments with Big History, despite still being in the pilot stage and thus not having been able to make use of external evaluations, are very promising. The Big History movement is still little known in Italy, and these trials have spread awareness of it through pedagogical journals (Codetta 2017, 2018). The experiments in introducing the Big History approach during the final two years of secondary school in Italy have provided an abundance of content, encouragement, and methodological indications. Thus it was possible to identify a model that can be adapted for many secondary schools.

- The model does not necessitate modifying the school curricula, which dictates approximately one thousand hours of lessons annually, divided between twelve or more subjects. It requires dedicating to the study of Big History only eighty hours spread out over two years for students ages 16–17.

- To introduce Big History in secondary schools, a tutor experienced in Big History is needed. The tutor proposes to teachers a reflection on the contribution that the subjects they teach can make to the construction of a unitary vision of the universe and its history. In this interdisciplinary activity, all the disciplines of the school curriculum are called together to converge on a single objective.

- From this reflection comes a two-year project in which the students, divided into working groups, conduct investigations into the materials elaborated by the Big History movement. The surveys are carried out by consulting the knowledge platforms on the web

and, in particular, courses such as the "Big History Project."

- The students' research takes place during the school day for two hours a week. All the teachers of the grade are involved in rotation. Their purpose is to assist the working groups, leaving the students to lead the research, as well as observing the group dynamics of the students through observation charts.

- The course begins with a questionnaire about the students' preexisting ideas about the universe. Their answers are used to identify the words that students associate with the universe. They also help in the formation of groups of students with similar interests, and finally they serve as a tool for reflection through the development of conceptual maps.

- The tutor assists teachers and students remotely through an e-learning platform, comments on the journals turned in weekly by the working groups, and encourages the convergence of the disciplines to connect events of the history of the universe that are usually studied separately.

- At the end of the first year, through appropriate shuffling of the initial groups, all students must become familiar with the characteristics of the main complexity thresholds in the history of the universe and of the conditions that caused them to emerge.

- The products created by the students at the end of the first year—documentaries, video clips, e-books, comics, murals, computer applications, concept maps, reports—are evaluated mainly on the presence of the disciplinary contents incorporated in the products and how the students connect them.

- In the second year, students use the same work methods, enriched by educational field trips. They explore a geographic territory through the lens of Big History. In many parts of Italy, it is possible to directly observe archaeological, geological, and historical finds that tell the stories of at least half a billion years (Alvarez 2009).

- At the end of the course, the students reflect on the conceptual map of the universe that they created two years before and identify new concepts acquired during their research.

This experience shows that the convergence of multiple subjects in dealing with a complex topic such as Big History generates a highly interactive dynamic among the students in which the determining factor is digital technology. The students create different products, some of which stand out for their nearly professional quality, such as a documentary and an Android app. During the preliminary studies and product creation, a learning process is generated that brings out human qualities that cannot be substituted: creativity, adaptability, inventiveness, the ability to relate to others. In particular, the eight key competences recommended by the European Community are promoted (Enestam 2006): Communication in the mother tongue, communication in foreign languages; mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, and cultural awareness and expression.

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Was there a Big Bang?

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Abstract

The idea that our Universe emerged as a result of the extraordinary power of the Big Bang from singularity (i.e., a state of an infinitely small quantity and infinitely high concentration of matter) is still very popular today. It was one of the main postulates of the Big Bang theory that completely formed in the 1960s–1970s. However, at present this idea as well as the Big Bang theory is outdated, although it is still shared by many scientists. Being widespread since the end of the 1970s the Inflation theory appears more modern. The main reason for the emergence of the Inflation theory was that the Big Bang theory could not satisfactorily explain a number of the contemporary parameters of the Universe.

The Inflation theory makes still widespread views of the Big Bang theory archaic, in particular as regards the following points: 1) the history of the Universe started with the Big Bang; 2) it started with the singularity. According to the Inflation theory, the Big Bang was not the beginning and the moment of the origin of the Universe, but it was preceded by at least two epochs: inflation and post-inflationary heating. That is, the Big Bang or precisely the hot Big Bang is just a phase transition from the state of cold inflation to the hot phase. Since the Inflation theory does not consider the Big Bang as the initial phase there emerges an intricate problem of the role of the Big Bang in the process of the formation the Universe as a whole. The paper considers the confusion with the Big Bang notion, a number and sequence of 'bangs' and why the theory can dispense easily without the notion the Big Bang. We will also discuss some advantages and disadvantages of the Inflation theory.

Key Words

Big Bang, hot Big Bang, inflation, Universe, inflaton, false vacuum, the Inflation theory, singularity, quantum fluctuation, post-inflationary heating.

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Introduction: Big Bang Theory's Limitations and the Emergence of Inflation Theory

It is supposed that our Universe emerged about 13.82 billion years ago from the unknown state and substance. The history of the Universe, particularly its initial stages, is a scientific reconstruction whose most points are still considered to be scientific hypotheses. The latter sometimes may seem unbelievable ones. It is not surprising that there is no agreement among physicists and cosmologists about many issues of the initial stages of the history of the Universe. Completely formed in the 1960s–1970s the Big Bang theory has been popular long enough (about history of the term 'Big Bang' see Wood 2018: 1–4). At present it is outdated in its certain aspects, although it is still shared by many scientists. Being widespread since the late 1970s the Inflation theory appears more modern.

The main reason for the emergence of the Inflation theory was that the Big Bang theory could not satisfactorily explain a number of the contemporary parameters of the Universe, in particular why the

Universe is so homogeneous, isotropic, 'large' (spatially flat) and hot (Gorbunov and Rubakov 2010: 341; Guth 1997, 2002, 2004).

Due to the emergence of the Inflation theory many problems of the Big Bang theory can be eliminated. The Inflation theory makes still widespread views of the Big Bang theory archaic. For our topic the following points of this theory are more important: 1) the history of the Universe started with the Big Bang; 2) it started with the singularity (*i.e.*, a state of an infinitely small quantity and infinitely high concentration of matter). Below we will consider the main ideas of the Inflation theory. At present one should note that according to this theory the *Big Bang was not the beginning and the moment of the origin of the Universe, but it was preceded by at least two epochs*: *inflation and post-inflationary heating.* That is, the Big Bang or precisely the hot Big Bang is just a phase transition from the state of cold inflation to the hot phase. Furthermore, due to the fact that the Inflation theory does not regard the Big Bang as the initial phase there emerges an intricate problem of the role of the hot Big Bang as a whole. In the words of Alan Guth, it is not explained what 'exploded', how it 'exploded' and what caused the 'explosion' (Guth 1997). Thus, it is not surprising that (as we will see below) as a rule there is no clear description of the phase of the Big Bang in the modern research.

In this introduction we find it is necessary to give a detailed explanation of our goals with respect to important subject of this article.

1. The article is written for the Big Historians and the Big History proponents. For them the article may be important since it allows defining important peculiarities that may often escape attention. With respect to the physical theory there will be nothing new for astronomers and astrophysicists, but in terms of the evolutionary theory and philosophy they may find something interesting.

2. The article is devoted to the analysis of whether one can consider the Big Bang as a certain real phenomenon or such a view is just a heritage of what was previously established in science. I am convinced that Big Bang is nothing more but a metaphor (just as Barry Wood [2018] and other scientist [see below]).

3. I would like to point out the aspects of the inflation theory which often escape attention. If one cannot speak about the Big Bang as a real event then it is important to define in what way one should interpret this notion within the inflation theory framework. Among the proponents of the inflation theory there exist disunity and different approaches often slightly manifested. I consider any clarification of this problem to be of vital importance for the development of Big History as a discipline and as a subject taught. And I think they provide insight into these complicated issues.

It is worth adding that when I define the Big Bang theory as outdated I mean in the first place its classical form, i.e. the Big Bang theory of the 1970s which is still popular. It is just like saying that classical Newtonian mechanics became outdated after the elaboration of Einstein's theory. It is really so. But at the same time under certain conditions it is valid and is incorporated as an individual case in the theory of relativity. The same happens with the Big Bang theory.

So today the Big Bang theory is firmly integrated within the inflation theory[1]. Thus, on the whole, it is probably unreasonable to speak about a dichotomy between the two theories which are mostly unified today. However with respect to the issue under study, they significantly diverge since the place of the Big Bang within the modern cosmological theory is unclear and undefined. While recognizing that the inflation theory forms a comprehensive theory with Big Bang theory, at the same time I argue that their merging has generated a number of problems and actually provokes an internal contradiction within the

1 It is possible to meet both statements: that the inflation theory incorporates the Big Bang theory and the opposite view that it is the inflation theory that is incorporated into the Big Bang theory. I prefer the former approach but actually, it is not so important how to express this idea since the two theories have actually merged into one. Nevertheless, these discrepancies just show that there is much confusion about the big bangs (which I tried to show in the article).

inflation theory itself. And that is what I will try to prove in what follows.

Main Ideas of Inflation Theories

Historically, Alexei Starobinsky's model of inflation (1979) was the first model developed in detail. But the best-known Inflation theory was first formulated in the famous article by Alan Guth in 1981, which continues to promote it extensively. Within the framework of this theory 'the fundamental properties of our Universe (*i.e.*, it is homogeneous, isotropic, spatially flat and hot) appear as the consequences of extremely unnatural initial conditions' (Gorbunov and Rubakov 2010: 341).

The Universe before the hot Big Bang. The inflationary stage. According to the Inflation theory our Universe's origin was the result of *quantum fluctuation* (*i.e.*, negligible small fluctuation but still having certain spatial parameters[2]). This fluctuation has put the forces of the so-called false vacuum in motion. A false vacuum is a hypothetical state of matter, in which, matter is repulsed and space is expanded due to negative pressure. That is why this stage is called *the inflationary stage* (*i.e.*, inflation of the Universe). The Universe has reached enormous proportions in the smallest fractions of the second. One should mention that a false vacuum had constant temperature. That is why the inflation is defined as cold. The heating had begun due to the processes described below. Vacuum-like energy as well as false vacuum itself is now often called the *inflaton*.

Completion of the inflationary stage, post-inflationary heating. The false vacuum is an unstable state of matter, so it started to decay quickly. On the whole, the inflationary period (as well as all the initial stages of the early Universe) was very short. Nevertheless it is important for the theory that it must not be smaller than an extremely short period of time, measured in the smallest units, so-called Planck units (from 70 to 100 such units within the smallest fraction of a second)[3]. This duration in terms of the Inflation theory was called the slow-roll of a scalar (inflaton) field. During this process the potential energy of this field decreased, transforming into the kinetic one. It is supposed that this leads to the formation of the so-called boson condensate. Eventually, the potential energy of the inflaton (inflaton field) reaches a minimum at a certain moment. This means that the conditions necessary for exponential increase are violated and the inflationary stage ends.

Thus, this leads to a rather rapid heating of the Universe. There comes *the stage of post-inflationary heating*, in which the boson condensate decays due to the vibrations (oscillations) of the inflaton field, which has reached its minimum energy. During the oscillation of the inflaton field one can observe the beginning of the formation of different particles about the nature of which there are different assumptions. The energy of the inflaton transforms into the energy of the emerging particles as a result of their interaction with the rapidly changing inflaton field. Figuratively speaking, one can observe 'pumping out' of the energy that led to the rapid heating of the Universe and the formation of elementary particles of ordinary matter. In other words, the entropy that was previously low in the false vacuum increased sharply. At the same time there was a rapid expansion of the Universe. And the inflationary equation of state of matter transforms into the powdered one. And later, when the heating had reached its peak, the powdered equation of state transformed into a radiation dominated equation. In other words, when reaching an ultrahigh temperature, the matter passed into the state of 'super-hot plasma consisting of free quarks, gluons, leptons and high-energy quanta of electromagnetic radiation' (Levin 2010)[4]. *Hence, within a fraction of a second there took place successively equations of state of a false vacuum*

2 It differs much from the Big Bang theory which regards the starting point of the Universe with the singularity (see above).

3 100 Planck times is something like a period of time from $5 \times 10^{-44} – 5 \times 10^{-42}$ s.

4 An ordinary matter that had appeared as a result of boiled vacuum and then a hot 'bang' had been remaining in a state of hot plasma for hundreds of thousands years (until the process of hydrogen recombination).

– powdered – radiation dominant (for more details see Grinin 2013).

Was there the hot Big Bang Phase? There are discussions about the temperature which the post-inflation Universe achieves as a result of these processes. In any case, it was very high, although, most likely, it was lower than it was expected in the Big Bang theory[5]. According to cosmologists and physicists, this leads to a kind of 'boiling up' of the vacuum, which, it should be noted, has already occupied plenty of space by that time. Postnov (2001) notes that during the period of 10^{-34} s. the stage of inflation 'prepares' the primary very hot substance in a very small area, and it expands by inertia.

Thus, in the previous description one can see a phase transition from the state of cold inflation to the hot phase. Just in this point of the Inflation theory there emerges a problem of identification of the place, role, and even reality of the Big Bang. The Inflation theory does not give any definition of this concept. On the one hand, they maintain that heating had resulted in a hot Big Bang which further dispersed the expansion of the Universe. One cannot find any great explosion in the hot Big Bang phase unlike the picture drawn in the classical Big Bang's scenario. Of course, one can call heating of the Universe the Big Bang, but the heating is a process, it was not momentary as a sudden explosion assumed by the Big Bang theory. We will return to the problem of the Big Bang concept below.

Comments on the Inflation Theory

The advantages of the Inflation theory from a philosophical point of view in comparison with the Big Bang theory are as follows: 1) the existence of matter and the Universe before the phase of inflation is supposed; 2) anyway, the process of the formation of the Universe looks exactly like a process (although very fast), but not as an act of creation from nothing; 3) the original size of the Universe, although small, but it is still more verisimilar than the singularity (the latter is an artifact of outdated cosmology); 4) the introduced hypothetical substance – the inflaton field – explains the processes as a whole with the help of physics, and not simply by the assumption of an explosion.

In the Big Bang theory, as the beginning of everything which emerged from the singularity, it was believed that the classical space-time started to form immediately in the course of explosion, because the Universe began to expand at once after the hypothetical state of singularity and also acquire the related characteristics. As Hawking (2001) wrote, Einstein's general relativity theory concludes that space-time arose at the singular point of the Big Bang. However, we proceed from the fact that the hot Big Bang was preceded by the inflationary phase, during which the Universe significantly expanded. Thus, a very rapid expansion of the Universe during the given period leads to the origin of classical space and time.

Disadvantages of the Inflation theory and its Physical fatalism

Now let us consider the disadvantages of the Inflation theory. They are as follows: 1) Introduction of the hypothetical substance. Inflation requires the introduction of some powerful repulsive force for its explanation (*i.e.*, the inflaton field or a false vacuum with negative pressure), the nature of which is not clear in many respects (see May *et al.* 2007: 38–39). In the inflaton field the laws of ordinary gravitational physics change, because 'matter becomes not a source of attraction, but a source of repulsion' (Sazhin 2002: 38).

Filling gaps with hypothetical kinds of matter is a form of science development. In this case it seems as a too bold idea.

2) The assumption that initially the Universe had very small (almost Planck) size and a huge Universe could arise from that size. We have no example of evolutionary processes when something very large would have turned out from one tiny unit. The process always proceeds as either the coexistence

5 Although there are no direct experimental indications that there were temperatures above several MeV in the Universe (*i.e.*, several tens of billions of degrees) (Gorbunov and Rubakov 2012).

of the mass of small units, which then form a new macrosubstance (system), or the gradual acquisition by a certain number of small units of the ability to grow and, as a result, the emergence of large units.[6] 3) The Universe's origin time is too short. In the end, although the Inflation theory significantly withdrew from the concept of the 'act of creation', as opposed to the Big Bang theory, but the generic features of this approach are still visible. 4) As in the case with the Big Bang theory an issue about the origin of the Universe which appeared to be 'almost from nothing' raises many questions (Rubin 2004). It is also unclear, 'where does the material come from in the first state of the world' (Cherepashchuk and Chernin 2004: 278)[7].

5) In general, both the Big Bang theory and the Inflation theory proceed from the fact that they must explain the present observed states of the Universe, including Hubble's law, the spatial homogeneity of the Universe, its flatness, *etc*. How far is such predeterminancy possible in terms of evolution?[8]

Why should these states be explained by the very initial conditions? Why could not they arise later under the influence of any factors? Apparently, this is connected both with the desire of cosmologists and physicists to see a complete picture that would explain everything, and that otherwise, if the theory of the origin of the Universe does not explain the present observed circumstances, then it is easily refuted and, in fact, not even considered. As a result, the emergence of Hubble's law is included in the Inflation theory, although why should not this expansion (if the redshift would not be later explained in another way) emerge later? The expansion of the Universe having arisen at the very first moment does not change by inertia. It looks rather fatalistic[9]. Moreover, the entire subsequent large-scale structure of the Universe was therefore predetermined by the smallest density fluctuations, which already appeared at the inflationary stage within extremely short fractions of milliseconds. It is very sad to realize that everything was decided in such a short period and in such a small amount (from the Planck size to 1 cm^3) of matter. Although the Inflation theory aims to withdraw from the concept of singularity with its full uncertainty in the physical realm, nevertheless the original dimensions are difficult to perceive.

One should mention that quantum dimensions of the original Universe in comparison with the singularity from the point of view of physics is a principally different state, since it allows using already known or at least formulated hypothetical laws and forces. But from the perspective of the ideas of evolution the differences between singularity and quantum dimensions are not considerable.

Confusion and Problems with Big Bangs

As we have seen from the above discussion, the stage of the hot Big Bang succeeded the post-inflationary heating stage. However, there are still a number of scientists who, just as before, consider the Big Bang as the moment of the origin of the Universe followed by inflation. However, this disagreement can be explained not only by differences in points of view but also by the confusion in terminology. The question is that when speaking about the Big Bang as an event preceding the beginning of inflation, it is often meant not the hot Big Bang (*i.e.,* classical Big Bang), but

6 To a certain extent the assumption of multiple of multi-faceted universes also implies such a variant of gaining the ability to grow, but the idea of multitude of universes is too speculative to be associated with evolutionary processes.

7 Postnov (2001) points out that the exponential growth in the sizes of the area with constant density means the growth of mass (energy) inside the area 'out of nothing', which might seem strange at first sight. However, there is no violation of energy conservation law – the growth of the positive energy is exactly compensated by the negative energy of the gravity field, which is created by the 'emerging' positive energy inside the expanding area. Therefore, the total energy remains the same in the course of inflationary expansion (see also Sazhin 2002).

8 Even the proponents of such views have to admit that 'according to modern ideas, space-time in the Planck scale is a fantastic figure, more like a monster from horror films than the object of physical research. Future research will show whether this picture is correct' (Sazhin 2002: 81). About evolutionary approaches in respect of Cosmic phase of the Big History see Grinin 2014; 2018.

9 Not to mention the fact that this contradicts the fact according to which the speed of the receding galaxies not only decreases but increases.

another one, *i.e.* the pre-inflation Big Bang.

Thus, today speaking about the Big Bang, it is necessary to specify which explosion is mentioned. The fact is that there is no common terminology concerning the Big Bang in physics and cosmology, which study the early Universe: there is considerable confusion here.

Sometimes the followers of the Inflation theory mention the Bang that preceded the inflation stage. *They might regard this bang as above mentioned quantum fluctuation or another hypothetical event of uncertain origin. Sometimes they talk about such Big Bang as a special phase of early history of the Universe. Unfortunately they do not clarify whether this Big Bang was the trigger for the quantum fluctuation, or it is just the beginning of the inflationary stage. In any case this Big Bang was definitely cold but not hot.* However, some researchers do not identify the pre-inflation cold Big Bang or do not mark it out as a special stage because such a variety in approaches implicitly creates a great confusion in our understanding of the notion of the Big Bang. Were there two Big Bangs or was only one or none at all? And after what stage it occurred? The confusion is growing because the Big Bang theory also implies the inflationary stage. But the sequence of stages differs from that of the Inflation theory. According to the Big Bang theory, the Big Bang was the first to occur and led to great inflation. And the Inflation theory suggests that the hot Big Bang resulted from the inflation. As we will see below, such a shift of the processes' order makes the Big Bang unnecessary stage in the sequence of events that occurred in the Universe. One should also note that not all researchers distinguish the stage of post-inflationary heating.

As a result this situation seems paradoxical. On the one hand, practically, there are no scientists who would definitely reject the Big Bang. On the other hand, a number of researchers who use this concept as something conventional, but indefinite, increases. It appears that implicitly or even explicitly they understand that the theory can easily avoid using the Big Bang notion. However, because the direct negation of the Big Bang may cause difficulties, probably they think that the best way to avoid problems is the indistinct mentioning of this moment. Thus, one should mention that the Big Bang seems to become a kind of metaphor, an indicator of fidelity to the mainstream, playing a role similar to that of the incomprehensible god in deism philosophy[10]. We recall that the situation is greatly complicated.

Among many followers of the Inflation theory there is an implicit assumption that there could be two trigger events which can be described as 'bangs', one of which preceded the inflation, and the other – followed it.

But the description and characteristics of the pre-inflation Big Bang are even more obscure than those of the hot Big Bang. It also does not have any common term; there are references to the Planck era of the Big Bang, the early Big Bang stage, the real Big Bang, *etc.* One should mention that due to this terminological and theoretical confusion it is extremely difficult to understand whether one or two explosions are meant, as well as to describe the real sequence of stages[11]. If there were two Big Bangs then the origin of the Universe would schematically look like this: the pre-inflationary Big Bang – inflation (expansion of the Universe) – post-inflationary heating of the Universe – the hot Big Bang. But such a reconstruction is not presented anywhere because perhaps as was mentioned above it is easier to avoid difficulties. Most commonly mentioning of the Big Bang among physicists simply looks like a tribute to a tradition they dare not to violate, and therefore such mentions are rather ritual than filled with specific content[12]. In general, it appears that

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11 It is difficult to understand also from Guth's article with the title 'Was Cosmic Inflation the 'Bang' of the Big Bang?' which is relative to our topic.

12 Though one can find the following arguments. It is shown that such an event as the hot Big Bang is not a necessary stage in the Inflation theory. Now it is clear that the inflationary stage played a role of the 'bang' (Postnov 2001). The moment when the Universe is heated up is *now called the Big Bang* (*Ibid.*). The boundaries between inflating and thermalized

the early history of the Universe may well do without using the concept of the Big Bang, using the scheme: fluctuation (whatever it may have been caused by) – inflation – post-inflationary heating.

Thus, among a large number of astrophysicists the very idea of the Big Bang has been losing not only its substantiality and uniqueness, but the need in general. However, at the same time among others and especially among those who popularizes the early history of the Universe one can observe dominating desire to see something extremely real and apocalyptic in the Big Bang. Perhaps, it would be too strong to call the Big Bang 'a misleading, ugly and trivializing name'. (as Timothy Ferris did; see Wood 2018: 2). Nevertheless in the light of modern points of view it is very necessary to regard the Big Bang not as a real huge explosion but rather as a metaphor that still exists due to tradition[13]. The matter is that 'the Big Bang, just as we imagined it traditionally, most likely did not occur at all' (Mukhanov and Orlova 2006). At the same time, most initial conditions that determine the most important characteristics of the modern Universe are also referred to the inflationary stage, rather than the hot Big Bang.

Conclusion

The importance of the Inflation theory. The theory of the Big Bang could not explain very much, which could be explained precisely with the help of the Inflation theory. *At present, the Big Bang theory is firmly integrated with the Inflation theory*. From the point of view of cosmology and physics the introduction of the stages preceding the hot Big Bang more or less successfully solves all the problems related to the initial data of the hot Big Bang epoch, and eventually explains the flatness, homogeneity and isotropy of the observed Universe. The inflationary era is very important for modern cosmological and cosmophysical concepts. Alan Guth explains with enthusiasm, 'Inflation is not just a theory of the initial (ultimate) beginning, but it is a theory of evolution that explains essentially everything that we see around us, starting from almost nothing' (Guth 2002; about creation from nothing see our comments above).

However, one should understand that the emergence of the Inflation theory is the result of searching for such physical conditions under which it would be possible to explain the characteristics of the modern Universe. For modelling such initial conditions some scientists introduced hypothetical states of matter and energy. Therefore, it is absolutely normal that there are dozens of competing models of the inflationary stage, as well as the fact that nearly all parameters of this stage are unclear. What is really surprising is that science can put forward well-structured and reasonable hypotheses about such distant and extremely short periods.

Thus, on the one hand, the Inflation theory is a triumph of possibilities of modern cosmology and physics, but on the other hand, it perfectly demonstrates the limits of our knowledge, and the extent to which these hypotheses can be exotic and strange to explain things near these limits.

One should not forget that in these cases we are talking not about even theories but paradigms (Guth 1997), not the proved facts but *hypothetical* events and substances. It is also worth agreeing with Guth's (1997) statement that if it is true that the Universe arose from inflation, we cannot regard the quantum fluctuation as the cosmic origins. This idea leads us closer to its beginning. However, it is absolutely unclear, whether there was something before the inflation and what it

regions play the role of the Big Bang for the corresponding thermalized regions (Garriga and Vilenkin 2001; Vilenkin 2006, 2010; in all cases, emphasis added by me. – *L. G.*).

13 Perhaps, it also has some sense from pedagogical point of view. In the paper by Wood (2018) one can see a discussion on possibilities of using the notion of Big Bang for pedagogical and other purposes as well as the author's suggestion to use as synonym of 'Big Bang' term 'the big beginning ' as beginning of TIME, SPACE, MATTER and ENERGY as well as other initial substances. He clarifies his goal: 'Assuming "big beginning" as a non-contentious synonym for big bang, the task of communication must be redefined: How can this incomprehensible event when time began, space unfolded, matter appeared, and energy bifurcated into various forces be formulated as imaginative narratives that will broaden and deepen its meaning and significance in harmony with discoveries over the past half century?' (*Ibid.*: 3).

was. There are a number of theories about these topics.

In particular there is a wide variety of very original theories according to which our Universe is not the only one, but just one of the myriad universes of the Multiverse[14]. According to some theories, these universes do not contact with each other, according to others the collisions of universes cause Big Bangs. Anyway, according to such approaches, the origin of our Universe 13.82 billion years ago is an ordinary event in Multiverse. However it is a very important event for humanity and the starting point for Big History because any history must have a beginning.

14 E.g., according to A. Linde's theory, 'the area of the Universe that we are bserving now occupies a part of one of these "bloated" clusters' (Rubakov and Gorbunov 2010: 357).

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The Evolution of Social Constructs:
A Proposal for the Re-Conceptualization of Sociobiology for Understanding Interdependent Social Networks as Evolving "Organisms" Using Norbert Elias's, *The Court Society*

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Abstract

Evolution by natural selection applied by sociologists has been met with great resistance since Herbert Spencer (1820-1903), marked by dark notions of power and authority associated with an uncritical and enthusiastic application of natural selection to fashionable notions of race and privilege. E.O. Wilson's (1929-) Sociobiology (1975) attempted to reignite the possibilities of evolutionary discourse using modern genetics to social systems but was stymied by the racialized legacy and liberal notions of "genetic determinism." Here, the sociobiological framework is re-imagined by extending it from individual gene mechanisms and behavior, into social figurations of large-scale actor networks. Using the conceptual tools and historical analysis of Norbert Elias's, The Court Society (1983), detailing Louis XVI's court and the interdependencies between its members, I will be suggesting that these networks of interdependence composed of individual actors are facilitated and constrained by the processes of natural selection, and therefore can be analyzed as such. The entanglement of dependencies created by actors within a network formulates "massing" points that identify the networks form and function as a "social organism". The value gained in understanding the organic fluidity of social networks, how they are formed, shaped, evolve, and come into conflict with competing social figurations, may provide a new and naturally derived way of interpreting interdependent social actor networks, and provide greater depth into the conceptualization of human social relations. Finally, such a view of history and sociology would align with the principles of Big History by understanding the human subject as bound to the same processes of development that have been occurring to all forms of matter in the Universe over the last 13.8 billion years.

Key Words

Evolution; Sociobiology; Sociology; History; King Louis; France; French Revolution; Norbert Elias; Court Society; Social Networks; History; Interdependency; Natural Selection

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Introduction

The social scientist, specifically the sociologist, has a peculiar role to play as an academic within the contemporary academy. Bound by the genesis of the discipline and its traditions, the sociologist continually orbits around the notions of scientific, objective, and empirical based study. This is easily observable, as many contemporary sociological papers will be fashioned in a manner similar to scientific inquiry, citing regression models, mean scores, and a myriad of other analytical tools adopted and adapted for sociological purposes. These methods, and the continual development of scientific based social research, are founded upon the works of thinkers, such

as Auguste Comte (1798-1857) and Émile Durkheim (1858-1917), who called for the study of the social with the tools of the natural philosopher in order to better understand and, the hope was, model the human experience.

Since Comte and Durkheim, works have emerged that have been profoundly impactful, not only for the development of critical social thought and assessing the human condition so as to better understand it, but also for the global consequences some such sociological works have had. Karl Marx (1818-1883), Max Weber (1864-1920), and Thomas Kuhn (1922-1996) for example, have reshaped human understanding of social class, power, and scientific advancement through sociologically themed frameworks, fundamentally changing how academia and the popular mind accounts for such subjects. The example of Marx, for example, exemplifies how the social sciences have reshaped entire human collectives into new political and social forms. The discipline of sociology, therefore, has had powerful effects on the globe, and the possibility of future effects is nearly certain as currently incomprehensible social opportunities and conflicts have yet to arise.

That the genesis of sociology was from the natural sciences has resulted in an intimate, yet strained, relationship. Examples of negative outcomes from sociological endeavors are scattered across history's continuum, but none were more destructive than the application of a particular natural scientific principle to the human condition, specifically Charles R. Darwin's[1] 1859 publication (1809-1882) titled, *On the Origins of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (1859). The consequences of this book were further modified n 1864 when Herbert Spencer (1820-1903) published, *Principles of Biology*, an influential text which includes the now famous (or infamous) phrase, "survival of the fittest" – an interpretation of Darwin's work that has been deeply engrained within the popular mind's understanding of natural selection.

Darwin's work, followed by Spencer's, metaphorically represent the first strand in what would become a complex web that continued to be spun well after the release *Origins*, ensnaring learned and layperson alike. Social Darwinism emerged in the wake of the newfound popularity and insight that natural selection had provided. This radically reformulated the perception of, for example, social class, race, and the possibilities of human perfectibility. In the twentieth century, with the advancements of science and technology and the psychological impact of World War One, it wouldn't be the bullet or the bomb that had the most deeply impacting and transformative effects on the globe in World War Two, but eugenics programs. The consequences of the sociological adoption of natural selection principles has never been forgotten, and to this day there remains a complicated entanglement of resistance against the social sciences using evolutionary processes (Barkow 2006).

Evolutionary sociology has since become a taboo topic for academics and their institutions, as sociobiology, for example, is a marginally and skeptically considered, often heavily criticized, academic pursuit. This is the result of a combination of factors, including the collective living memory of the eugenics era and the tradition of studying the social through the social (Barkow 2006). Scholars such as E. O. Wilson[2] and Jerome Barkow, as well as advocates in the natural sciences too, such as Carl Sagan and Richard Dawkins, have, or are advocating for evolutionary social sciences, pleading for the possibilities it would allow.

My hope here then is to propose a reintroduction of evolutionary thinking into sociology, one that avoids claims of determinism by being a historical "science." I believe this is necessary and overdue given the intimate relationships that much of the natural world has revealed through the methods of science, and as a prominent aim of Big History. But more than this

1 Darwin was spurred into publication by a letter he received from Alfred R. Wallace (1823-1913) which included a very similar theory to Darwin's.

2 The founder of sociobiology.

because it becomes logically incoherent to maintain that human beings, products of natural selection, would not outwardly project through their creations products that would themselves be bound to a naturally influenced systems of development.

The first thing I shall do is provide an elementary introduction to evolution through Darwin's natural selection, followed by an introduction to evolutionary social science (sociobiology) using the contemporary conceptualization from Jerome Barkow to provide the basic definitions and conceptual tools needed to reconfigure this knowledge for a case study using the work of Norbert Elias's (1897-1990), *The Court Society* (2006). Elias's work provides a detailed analysis of the royal court of King Louis XIV (1638-1715) of France during the seventeenth century. In it, Elias provides a richly detailed account of the interrelated network (figuration) that demonstrates the evolution of the court society by modeling the complex web that existed using socio-historical methodologies.

In using Elias's, *The Court Society,* I will show how a particular social structure and its actors, specifically the royal court of King Louis XIV, formulates its own uniquely identifiable network that all its members contribute to sustaining, in effect becoming its own unique social "organism". This will show that the processes of social evolution cannot be understood by specific moments or specific individuals as Big History claims. This folly leads one to err in understanding the interdependent complexities of social relations and the environment to which they belong. In adopting this proposed Big History social framework and testing it against historical work, the complex webs of human relations through the medium of spacetime[3] can finally be understood in similar fashion to the laws of nature already established by the natural sciences, allowing a deeper and more holistic view of the temporal dynamics of social patterns. In short, using the proposed tools of an evolutionary social science by building upon and updating the framework and evidence Elias provides, it will be shown that adopting evolutionary principles into sociological studies opens the possibility of social evolution as a real avenue of study, a prospect that can enrich research by more fully realizing the complexity of our interrelated, naturally bound, social existence.

Evolution by Natural Selection

In this paper, I shall only be discussing natural selection with a soft touch on genetics, as it is what relates directly to the type of investigation that this socio-historical project allows for. While the prospects of implementing the modern synthesis into this work can be enticing, I focus my attention on applying the basics of what Darwin discovered and suggested (genes) to the social structures of history. Being that historical work is an intellectual construction made in the present but of the past, there are bound to be errors of human subjectivity and misinformation. The precision to which contemporary evolutionary biological science would, for my purposes in proving an introductory example of societal evolution, only get in the way by adding unnecessary complexity. I ask that the reader take this is a small contribution into the understanding of history through a specific sociological framework, and I encourage the reader to refine and expand what I have done here.

For our purposes, this introduction will focus on three key concepts: time, variation, and environment. Time, the meaning and breadth of time, underwent radical changes during the nineteenth century, being influenced from fields such as paleontology and archeology by discoveries of dinosaur fossils and lost ancient civilizations (Stewart 2011). Given the newly emerging fossil and archeological evidence, it was becoming increasingly clear that species long dead had striking similarities to contemporary species populating the earth. The mechanical and physical features of fossil plant, land, and aquatic species shared

3 I use spacetime in a manner applied to the social. It, like its natural science-based counterpart, is used to identify the way in which occurrences in space and time are not static and separate entities. Events that occur within the human experience have rippling, wave life effects that transcend through generations in identities, institutions, etc. Spacetime defines a more dynamic and fluid movement of social history through the human experience.

striking resemblances with contemporary species, leading both Darwin and Wallace to conclude that current species must be related to such ancient species; core similarities masked by obvious differences as a result of time.

Variation was, and still is, most popularized by Darwin's reference to the finch of the Galápagos Islands. Finch on multiple islands of the Galápagos each had slight variations, most commonly noticed in their beaks. Some were substantial while others less so. Though structurally the same bird, the beak, along with variations in colour and size, were consistently isolated per island, a finding unanimously shared across other species (Darwin 1959). Darwin concluded that the only way such patterned dispersion of variation could occur would be from a hereditary inheritance through generations of time (Darwin 1959).[4] The process of heredity dictates that specific traits of the parents are transferred to the offspring of said parents. Hence, the variations of the finch which Darwin observed on each island were traits carried forward through the reproduction process (Darwin 2003).

Why would finch vary from island to island though? Why would they become seemingly different birds? Darwin, and Wallace in his own studies, found inspiration in a paper by Thomas Malthus (1766-1834) called, *An Essay on the Principle of Population* (1797). This economics piece detailed the struggle of population growth predicated upon resource sustainability, specifically food production. Malthus concluded that populations will grow at an exponential rate while food resources only develop at a uniform rate. This meant an inevitable struggle of human survival based on resources, where populations, and ultimately civilizations, would collapse should population growth outpace its capacity to support itself given the available resources. Both Darwin and Wallace believed that Malthus's work, intended for economic and political discourse, had actual application to the natural environment (Darwin 2003). Noticing that common and abundant species such as worms and beetles had not overtaken the earth, the totality of the environment must be affecting the ability of such species to repopulate, creating systems of both necessity and chance. Darwin had noticed that food resources were different depending on which island he was on. The distinct variation in beaks was not random but necessary to survive on specific islands given their environment (Darwin 2003). Where food was softer and required less pecking, finches had lesser beaks; where food was hard and required force, beaks were more substantial.

Since *Origin*, much has become clearer regarding the mechanisms behind and involving natural selection,[5] specifically genes. The human being contains about 24,000 genes,[6] each is a piece of information in a sequence of nucleotides,[7] and each being a possible unit of heredity (Barkow 1989). Together, these nucleotides form a molecule strand of deoxyribonucleic acid, or DNA, the double helix. A single gene does not provide information for a specific body part; instead, multiple proteins work together to provide information for certain traits or parts. Half of the genes within the helix are not directly responsible for any particular piece of information, but instead communicate in tandem with other genes, functioning as a 'switch' in order to turn on and off certain information.[8]

4 A natural process, giving reason to the similarity of a child to its parents. This led to an early concept of the gene that pre-dated current understanding of genetics, which was first introduced by Gregor Mendel (1822-1884).

5 A testament to the work of Darwin and Wallace, much of their core work was correct and is still used in modern biology.

6 Of which 98.8% of is shared with the common Chimpanzee, 88% with a common mouse, and 24% with a wine grape. This was discovered after the revolutionary work of the Human Genome Project which not only sequenced the human genetic code but paved the way for the sequencing of thousands of living species, and tools that in the future will enable genetic modification at an unprecedented level.

7 The proteins thymine, guanine, adenine, and cytosine. Together creating the alphabetic code of the genetic sequences that make up all living things.

8 A process necessary for the development of any species given the phenotype. An example would be human beings developing as an embryo with a tail but losing it as development continues within the womb, or the shape of hands, even though all mammal hands have more-or-less the

The phenotype, or an organism's described, inherit traits, are both a product of the information of genes and the environment to which the genes belong. Critically, the information of genes is affected by the physical external and internal environments through a highly complex process of exchange. For example, factors such as light, sound, heat, hormones, and foreign chemicals, can all contribute to the alteration of genes or genotypes (a gene sequence), changing the transmitted information and consequently altering the phenotype as a whole (Lobo, 2008). This is a more technical description of what Darwin and Wallace discovered and suggested,[9] but the core concept is the same. The transmission of information depending on the gene sequence and the physical environment leads to evolution through slow adaptation and hereditary transfer.

In understanding genes and the influences that the environment has, the process of mutation as one of the prime components of allowing for evolution by natural selection to function becomes clear, and will be shown to important later on. The double helix, DNA, is constantly split in half and copied by a complex molecule called the replisome; but the copy is not always perfect, and gene information can pass through re-sequencing altered compared to the original code. As a result, this can change either one protein or large sections of the sequence – this is the basis of a mutation. Within the germ line,[10] a mutation could result from hereditary mutation (having been passed on for a generation or more), or somatic mutation (a mutation that can occur at any point in an organism's lifetime). Sometimes a mutation occurs that provides an advantage to the species, such as more substantial beaks; as a result of natural selection through the function of environmental advantage, such a mutation would become a successful trait.

same shape in embryo form.

9 I am using discovery here because their work on natural selection and hereditary transmission was foundational to modern evolutionary biology which is scientific fact.

10 For reproduction, DNA is copied by RNA for the purpose of fertilization and impregnation.

The result of such a success would allow that organism to have what is called a genetic fitness, the advantageous position that a particular genotype provides the species. Thus, the newly mutated species would become reproductively more prosperous by having a survival advantage. The new advantage, and the greater success in reproduction leads to the survivability of the new gene sequence to exceed that of the pre-mutation gene sequence. Through the process of natural selection, this new, successful gene sequence will overtake the old sequence, called genetic drift.

Sociobiology, Evolutionary Social Science, and Compatible Integration

A single gene does not determine an individual's outcomes, instead a gene exchanges information with other genes that is affected by a multitude of internal and external factors. This process is very similar to a human beings' navigation of social experience (Elias 1991). Barkow suggests it is the mechanisms of gene expression, the in-between of genes and their respective behaviours, which have evolved over time in response to adaptation, and where evolutionary social sciences should be focused (2006). Expressions of these mechanisms could range from gender roles to the organization of identities. The study of these mechanisms, Barkow claims, breakdown simple cause and effect arguments, allowing the social scientist to study the depths of what connects cause *x* to effect *y* (2006). In short, such a study would analyze the complexity of the interconnected relationships that internal circumstances have with external ones. For example, our ability to navigate a variety of cultures, or to control ourselves in social environments are, according to sociobiology, the product of evolutionary processes allowing us to adapt to cultural environments, an advantage for a cultural species like *homo sapiens*. Our central nervous system, a product of evolution itself, has developed the mechanisms required to navigate through different cultures. This is our evolved psychology (Barkow 1989). Or more

simply, our human nature.

For sociobiology, human nature is a dynamic construct, as varied and complex as the multitude of cultures. Each culture will have developed its own evolutionary psychology, its own human nature, in a completely different way than any other culture. The differences between cultures has nothing to do with a hierarchy of development. Technology and science, for example, do not equate to a more highly developed culture, all they do is change the unique environment which one must navigate through.

Navigation through culture is only possible by learning, occurring either individually or collectively. When individual learning becomes efficient enough that others would benefit, social learning occurs, and through generational information exchange, the creation of culture (Barkow 2006). Culture, Barkow writes, is the total pool of available knowledge resources from which the individual can navigate and draw from (Barkow 2006).

Cultures are not static, and therefore are constantly adapting. An individual can draw from multiple pools, and globalization is an example of multiple information pools being accessed, and by consequence, changing cultures. As a species, we are inherently dependent on these information pools, for *Homo sapiens* are the only species that requires learning for so long and to such an intimate extent throughout its lifetime. We continually shape our identities and institutions, our very realities, from non-radical social constructionism from the available information pools (Barkow 2006). Cultures not only shape individuals but are also shaped *by* individuals and their adaptation to changing environments. The ability to 'edit' culture is only possible given the nature of this relationship between individual and the environment. Cultural editing comes from the desire to achieve a different social reality, such as changing class statuses (Barkow 2006).

In adopting evolution into the social sciences, Barkow writes we will adopt what he calls vertical or compatible integration (Barkow 2006).[11] Compatible integration is the ability for disciplines to share in a consensus of acknowledged research and theory. For example, within the natural sciences the theories of chemistry work with both physics and biology. Adopting a similar position would allow the social sciences a more holistic study, with each social science contributing uniquely as a discipline and yet towards a greater whole. Barkow identifies three distinct advantages in adopting compatible integration. First, culling theories across disciplines would allow social scientists to be trained in a more topical format, learning themes and theories from across disciplines (Barkow 2006). This would allow the social scientist to observe the problem more robustly, while also allowing critical analysis in areas that are currently incompatible across disciplines. Second, a more grounded and compatible relationship with the natural sciences (Barkow 2006). Lastly, in training social scientists with compatible integration, social scientists would be more interdisciplinary, such as a biologist requiring chemistry and physics (Barkow 2006). Like the natural sciences, mastery of all is not required, but comprehension is essential.

In introducing both evolutionary biology and evolutionary social science here, my aim is to demonstrate that such tools of thinking are not deterministic or inherently malevolent in revealing the superiority of one culture or ethnicity over the other. But in fact understands that each species, each culture, as a unique expression of what evolution allows, must be understood and studied as a unique expression of the possibilities of the evolutionarily developed mechanisms to which our species has been granted. It provides new understanding to the way that the evolution of the human species is not strictly bound internally by genetics, but is also externally shaped, allowing modification to our social realities. Like

11 I use compatible integration because I find the use of the word vertical to have too much implication in some kind of hierarchical order. Compatible is more applicable to what Barkow outlines as a shared interdisciplinary compatibility anyway.

biological evolution, social evolution is constantly adapting to new circumstances as new information pools inform new networks of interrelations, mirroring the environments effects on genes. The human being becomes the microorganism that forms a single point of bonding in the network of interrelations (many points), forming a whole "organism" of the social reality. In this way, it can be understood how individuals interrelate with institutions, creating complex networks that develop their own unique "phenotype." This shall be expanded upon below.

The Court Society

The Court Society, published in 1969, represents an excellent introduction into the thought processes that Elias had on structure and agency and the relationships they share. In the particular case of *The Court Society*, Elias uses the royal court of King Louis XIV as the central point within his figuration model of study, but the selection of this topic is itself important for a few reasons. The simplest reason is that the reign of Louis XIV is generally marked as the beginning of the end for both the reign of kings in France and what is known as absolute monarchy,[12] which was most notable in France. A second reason is that the reign of kings from Louis XIV to Louis XVI is notorious for great indulgences and lavish spending. The *Château de Versailles* is a product of this era, the largest and most elegant royal residence ever built – a testament to such times. Louis XIV's need for power and material wealth led him to bankrupt France through continual wars and indulgences, perpetuated by the new money economy. Last, and most importantly for my purposes, this particular moment of spacetime represents the importance of Big History, in that the failure of traditional historical research methods tend to focus on individual people and their actions instead of the wider influences of the community and environment, something Big History is uniquely situated to do. Louis XIV may have been an important figure in France, but he is by no means the fixed centre of gravity, as shall be shown.

This is the foundation of, *The Court Society*, that not one particular moment, not one particular individual, is the cause of history. This is an overly common fallacy and is a product of the discipline of history lacking a sociological (or Big History) perspective. Elias writes:

> Without a sociological analysis of the specific strategy by means of which a ruler like Louis XIV maintained the constantly threatened elbowroom and manoeuverability of the royal position, and without elaborating a model of the specific social structure which made this strategy both possible and necessary for the individual ruler's survival, the behaviour of such rulers would remain incomprehensible and inexplicable. This makes the relationship between the sociologist's and historian's standpoints somewhat clearer (2006:5).

The historian, in pursuit of chronology, has consistently forgone the framework of the sociologist, and instead has focused on "unique and unrepeated sequences of events" (Elias 2006:6). This, according to Elias, has resulted in a "failure to undertake a systematic study of social positions…and therefore the strategies and scope… [This] leads to a peculiar narrowing of the historical perspective" (2006:6). Essentially, the historian does not use models of study, instead, "connections between particular phenomena are often left to arbitrary interpretation and speculation. This is why history…provides no real continuity of research" (Elias 2006:6).

Conversely, sociology is also in a position of "narrowed perspective" because works of sociology often lack historical depth and focus almost primarily on systems, leaving behind the individual. Elias writes, "[t]he self-image of many sociologists makes it appear as if they are concerned exclusively with figurations without individuals" (2006:30). A simple

12 An absolute monarchy is described by the rulers control of the entirety of state operation, such as the judiciary, administrative, and internal/external affairs, under the blessing of divine right, or God's will to rule.

analogy to visualize this can be made with a spider's web. When looking at the spider's web, if all one sees is the web itself – the strands of adhesive silk forming the structure – then the invisibility of the spider or the flies caught, perhaps even the tree branches it was cast between, devalues the study greatly, possibly even entirely, reducing the total visibility which the sociologist can "see" the whole figuration in which the environment, the web, the spider, and its victims interrelate.

What is required then is an approach via Big History – a combination of the history, sociology, and in this case, the natural sciences. The study of history, with its focus on particulars, such as individuals and the 'unique and unrepeated', is used as the evidence for the testing of sociological frameworks with its focus on figurations. The resulting socio-historical survey would create the tools necessary to see the ways in which individuals are shaped by figurations and also how individuals shape figurations. In this way, the field is no longer a two-dimensional plane of simple cause and effect, as history operates, nor is it a stage void of actors, as sociology operates. It becomes a multi-dimensional model of interdependent threads creating a vast and complex web.[13] The ways in which interdependent actors are bound to one another will result from a massing of connections depending on the information available, particular influences, the environment, and the structure one is studying. The concentration of connections will be uniquely shaped depending on the figuration (which structure is being observed), becoming the critical point of study for the researcher, and informing the way in which the structure is shaped and flows, while also illuminating the relationships shared by the actors within it.

Elias begins his study with the physical structures that the nobility occupied, their residences, or *hôtel*. The architecture had two critical functions. First is the statement that the display of a residence had for a family.[14] The material wealth on show was critical in the maintenance of one's social position for status-consumption and its display directly reinforced one's rank and title, capable of boosting the house's status.[15] The second function is that it was a physical representation of the court society of the king, just in smaller form. This was an attempt to not only copy the elegance of the kingly estate, but to also become, in a sense, to embody the power of the king himself. The primary and largest room was the great hall where the nobles of that particular house would host parties, such as *salons*, and manage their affairs. These were critically important for the family, for such social functions were displays of wealth and instances to gain status.

The bedrooms of the lord and lady would be separated, representing the great social distance that was customary in the court society. The lady and lord of a house could spend days without ever seeing each other because social circles were so wide and various, and the maintenance of said social circles was of the utmost importance. Such separation was informed by the strict aim of bettering the social status of the house. This social distance was important both for the noble in their home and the king in his. It allowed the master of the house control of the immediate environment by conducting the noble guests for the master's social benefit.

For the king in his home of *Versailles,* this control was a larger and more extravagant version of what the nobles had imitated. The king's court:

> Represented for him…his primary and

13 The best analogy to think of this would be to imagine the galaxy filaments of the cosmos at the largest scales known. They exist in three dimensions, and so to do the social figurations being proposed here. The cluster of gravity in the galaxy filaments would be where the strongest massing of single points (actors) converge in the figuration.

14 The family, or house as it is sometimes called, is critical in understanding the nobility. Before King Henri IV opened up the sale of administrative roles to the ever-richer bourgeois, the lineage of a family line was the most important component of noble status. Old families with close ties to the royal family would be in a much more powerful position than that of new or landed noble. The maintenance of one's family position and personal influence becomes the most critical function of the court society.

15 The house used in this way identifies the importance of a family's name and its genealogical significance.

> most direct sphere of activity, the country being only a secondary and indirect one. Everything…had to pass through the filter of the court before it could reach him… everything from the king had to pass [through the court] before it reached the country. Even the most absolute monarch could exert an influence on his country only through the mediation of the people living at court…Thus the sociology of the court is at the same time a sociology of the monarch (Elias 2006:46).

The king's position in court as master of the house is essential in beginning to understand the way in which the king's position is ensured only by those who live and act around him. Louis XIV was not capable of running France without the mediation of the court people, nor where the court people in a position to be nobility, and therefore court people, without the king.

The dependency of the nobility on the king and the king on the nobility[16] is the result of a "specific figuration formed by these individuals and the specific interdependencies binding them together" (Elias 2006:73). The courts figuration[17] ensured that status-consumption was necessary in maintaining one's social position as the nobility vied for status over each other. What appeared as indulgent to anyone outside of the court figuration[18] was in fact similar in every respect to a bourgeois accumulating capital and saving it for future investment or the working class needing a wage (Elias 2006). The means of maintaining one's status, their survivability, was different but the objective the same (Elias 2006). For the court noble, their rationality and the necessity of status-consumption to maintain or improve their social position, was critical in gaining status over their rivals. The opinion of the court peoples was a, "formative and controlling instrument" which, "no member could escape…without putting at risk [their] membership, [their] identity as part of an elite, which was central to [their] pride and honour" (Elias 2006:104). Families were constantly rising and falling in this highly competitive figuration. To ensure one's position and that over others, opinion was the currency of the highest importance, thus status-consumption was essential in maintaining a well-positioned opinion in the struggle for status. In turn, this forced a closer dependency on the king, for being in close proximity with, and in the good graces of, the king was the most advantageous and prestigious social position. It granted the highest in purchasing power and reputation Acting in accordance with the practices of the court was essential to achieving this.

Etiquette and ceremony were the most important social practices in court, and nowhere was it more prominent than in the *Château de Versailles*. The kings *revée*, the king's wakeup, was an exceedingly complex manoeuvre of six different social groups, ranging from high lords to invited guests, even the bastard children, each having a particular order and a particular function in this complex ritual of status. Each of the six groups had a different level of prestige, which the nobles continually struggled in achieving. The king's recognition would ensure, for the time being, a more prominent and stable position for the noble and his family. The king intimately knew this and maintained a distance to ensure the nobility never became complacent and continued their struggle.

Social distance was a product of the etiquette and ceremony of court society itself by the requirement of distinction. Elias writes that practicing distance led court people to hone the skills of observing and dealing

16 And also, the dependency of them on the "people" and vice-versa. Servants, for example, were critical for the operation and stability of the royal and noble families.

17 Elias uses figuration instead of system, which I strongly agree with, because system identifies a more rigid and structured relationship, that hints to a more manufactured organization of processes. Figuration is more open, more fluid, and more malleable.

18 The court "rationality" that existed for the court nobles could not be understood by anyone outside their network, just as in turn the "rationality" of the "common people" could not be understood by the nobles. This is made particularly clear during the French Industrial Revolution when the capitalists believed the working classes to be losing all their money to drinking and petty wastes, while the working classes believed the capitalists to be indulging in unchecked lavish spending. This dynamic is evident, though in the workers favour, in the period novel, *Germinal*, by Émile Zola.

with other court people, as well as personal restraint within court rationality (2006). Social distance required the formulation of strategies for advancement, whether by forming or destroying alliances, manipulation, or countless other tactics. However, like *Versailles* and the *hôtel*, the king's social distance was magnified to a far greater extent. It was the social distance of the king from his nobility that drove them against each other in an effort to become closer to the king. As master of the house and the court, the king observed and manipulated the members of his court to further his glory and power,[19] using etiquette and ceremony as his chief instruments.

It was the tradition of the court that made distance and etiquette and ceremony so essential. The constant rise and fall of court families meant that tradition is what ensured such practices existed and where maintained regardless of who resided in court; becoming a kind of dance where only the new members that best and most quickly learned the moves would survive. However, tradition is not static, and it evolved with each new king and court. Elias suggests that the aristocratic nature of France of Louis XIV began in the Middle Ages with a history marked by conflicts between the monarch and the growing nobility (2006). The form of rule so extravagant under Louis XIV began to flourish under the reign of Henri IV. Henri IV was what Elias calls the last "knightly king" due to the tighter relationship that Henri IV and his nobles shared, meaning there was far less social distance in court maneuvering (2006).

The shift to Louis XIVs more court-aristocratic based kingship lay in the money economy that had been developing since Henri IV. Before absolutism it was the feudal system (the time of Henri IV), where high lords were charges of their own armies and massive sections of the state. Swearing fealty to the king, they promised the king their armies when called upon, and such an arrangement meant a far closer and intimate relationship. This is partly the reason for the history of tensions between the royal and high families in France, a tension known well by Louis XIV in his youth. With trade rising, and the inflow of gold, silver, and other precious materials, the economy began to drastically increase. For the first time in history, the king had the wealth to purchase a full army of his own. The industrialization of the firearm made the knight irrelevant.[20] Inexpensive, easy to train weaponry and no shortage of able bodied men in need of a wage became the new standard. The word *sold*ier, from the French *la solde*, meaning money, clearly eludes to this history.

The increasing amount of money pouring into France and to the king reduced the ability of the nobles to gain profits from shared burdens such as war and agriculture. The king could now own and supply independently, and so the nobility began to decline. Having been for centuries responsible for armies and land, the new money economy put the nobility in a position of having to choose between resisting their decline, potentially greatly lowering their social position relative to the king (as a result of no money coming in from the kings use of their armies) or adapting by moving into a more centralized and dependent relationship with the king in his court. This is where pensions, money gifts, and other rewards from the king came from, beginning with Henri IV and becoming so vital in Louis XIV's time. The inability of the nobles to economically sustain their privileged position meant these gifts were necessary for their survival, becoming symbols of good standing with the king, tightening the interdependence of the court figuration. Consequently, the reliance of the nobility on the king for status and wealth made the king equally as reliant on the nobility as their needs perpetuated his absolute power.

The most important change of the new money economy was the rapidly growing wealthy bourgeois. Their new wealth, from trade and services, flowed in from across France, Europe, and the increasingly global economy. Under Henri IV, in need of this new classes wealth, he opened the purchase of offices in power positions to the bourgeois, which greatly threatened the already distraught nobility. During the rule of

19 This acts identically to the honour and pride of the noble, but it has much wider reaching consequences.

20 His armour and sword alone was an incredible expense.

Louis XIV, the king became indebted to the nobility by his absolute rule, the nobility indebted to the king by status and wealth, while the bourgeois rapidly grew in wealth, power, and influence, outside of the court societies figuration. The nobility, in constant contest with each other, were soon to be in contest with the high bourgeois. The combined struggle of the court peoples and the king created a delicate equilibrium in the struggle for status and power. Thus, "it is the balance and distribution of dependence that gave the institution that we call the court its specific character" (Elias 2006:223).

As the bourgeois continued to grow in wealth in power, the decline of the noble's prominence, given that human beings are reflective, led to a romanticization for the nobles more powerful past. The feudal lords of the past were, in the eyes of their court descendants, from a place of "nature," closer to food production, trees, mountains, and rivers. Elias writes:

> The past took on the character of a dream image. Country life became a symbol of lost innocence, of spontaneous simplicity and naturalness. It became an opposite image to court life with its greater constraints, its more complex hierarchical pressures, and its heavier demands on individual self-control (2006:231).[21]

As the nobility evolved over generations, certain functions they were accustomed to, which gave their lives meaning and value, were lost. Those of the nobility that could adapt to their evolving positions became "part of a tighter and more comprehensive network of interdependence" (Elias 2006:236). This required more self-control, more discipline, and less freedom. Elias uses memoires of court members from France, Germany, and Britain, to show the same attitudes of longing for a simpler and freer past existed across aristocratic societies (2006). Elias concludes that the continual civilizing process of societies, which led to more structure, more urbanization and industrialization, and more self-control, led people to dream of a simple, free, and more natural existence, one, "less affected by the constraints and emotional constrictions" (Elias 2006: 241).[22]

21 One must remember that this work was done before the environmental movement in the 1970s.

The Evolution of the Court Society

At the beginning of *The Court Society,* Elias addresses that biological evolution and social development must share a relationship, writing:

> There were no doubt biological, evolutionary changes in the social relationships and structures of our forebears. We know little about this side of the evolution of hominids, possibly because bio-sociological problems of this kind receive very little attention from specialists in human pre-history" (2006:14).

Elias remarks further that, "the sequences denoted by terms such as 'biological evolution', 'social development', and 'history' form three distinct but inseparable layers in a process encompassing the whole of [humanity], the speed of change being different at each level" (2006:15). From the beginning of his book, Elias identified that evolution *is* a factor in his work, though never explicitly applies it. I will be applying evolution more intimately to *The Court Society* to demonstrate the strong relationship that Elias's framework and natural selection share, using the concepts and systems written on in the previous sections.

The process of hereditary transfer through genetics, as I have shown, is a biological process, but heredity is not bound to biology, the process occurs across spectrums of existence. Examining the physical structures of the court people's residences, their size and layout, the functionality they have, are a literal physical mapping of their social figuration. The court

22 It is important to note that Elias writes that this romaticization only projects the aspects of the past that seem best given that particular societies present desires and ignores any of the less desirable characteristics. This is a testament to the framework developed by Elias, as this is clearly observable today and has been since the 1970s with environmentalism and the romaticization of the "noble savage".

society, through the interrelated figuration of their reality, provided the total possibility of what the *hôtel* and *Versailles* could be. The status-consumption and the continual drive for recognition informed the complete rationality of the court peoples figuration, it created the worldview within which they all acted and existed. Therefore, the buildings they inhabited, as Elias demonstrated, reflected their total identities. The evolutionary social sciences identify that biological processes are only one dimension of multi-dimensional processes. The court society's residences are literally offspring of the figuration of the court society itself, occupying, as hereditary transfer allows, the phenotypical traits of its parents. The great hall for the social events, the intimate distance between the Lord and Lady, and the display of wealth in the accessories and furnishings that filled the house are all expressions of the physical practices of the court society itself.

This does not apply only to the residences, but equally to custom and etiquette, tradition, romanticism, and the money economy, just to name some of what was examined. Each of these figurations have by necessity a process of heredity that ensures it can be adopted and learned in each individual that makes contact with them. This is the only way that social figurations can survive. That is, the individual (actor, or, think microorganism) attaches to a social figuration (structure, or, think organism) by consequence of their birth, environment, etc. which informs the identity of the actor, and being reproduced over generations through heredity, becomes the tradition which new actor's practice. However, this occurs in a nearly infinite degree of representational possibilities depending on the individuals use of information from the available pools and the affecting environment.

The information pools, or culture, the totality of shared and individual learning, contains the complete possibility of social figurations adoptable with which to construct identities and realities from. The court people pulled from their available pools given their respective figurations which informed their identities and realities by necessity of their positions, essential for their social and physical survival. Should the court noble not have had the ability to adapt to changing environments, then the equilibrium of power struggles that existed within the court society would have not been possible and the nobility would have perished entirely long before the French Revolution. Our biological evolution, as Barkow has suggested, has created the mechanisms required to constantly adapt to new social environments, and our social evolution is inherently tied to our biological evolution as a result of hereditary transfer of systemic principles. Critically, however, as figurations become increasingly complex and gain more connections (more actors), the ability for it to adapt slows, becoming more difficult to adapt as more actors have to individually adapt themselves within the figuration before the entire figuration reflects such a "mutation".

The primary difference between social and biological evolution is, as Elias describes, a variation in the speed of change. The reason for this is quite simple and it relates to the human being's requirement of information. Information is *the* single most important survival tool that *Homo sapiens* possess, for without it, the human species would have died out long ago. Our biological evolution is, by human perceptions, very slow, taking hundreds to thousands of years for very small changes, and hundreds of thousands to millions of years for more substantial changes. This is due to the fact that the environment, for most of life's existence, has been relatively stable. The environment is one of the most important components of evolution, so if the environment is influencing species in relative equilibrium, then evolution will continue in a biological way. However, with the introduction of the human brain, and its highly adaptive plasticity, something unique occurred: the ability to alter the environment reflectively.

Consciousness affected by reflection allows learning and the manipulation of the environment, and thus, the creation of culture. Culture, as a hereditary product of evolution, changes the environment in which the human species now develops. Information undeniably increases the ability to alter the physical environment

for human advantage, thus greatly increasing human survivability. The amount of information and the speed with which it can be obtained has exponentially increased continually since the emergence of the *Homo* genus. Through culture, humans are continually creating socially constructed identities and realities, adding new environmental dimensions to human existence each time. Through reflection, learning has continually become more refined by conscious reflection given environmental stimulus, evolving culture through such processes.

Within the court society, the continually shifting environment forced the nobility and king to adapt to new situations. They had to adapt their identities in order to stay environmentally advantageous in precarious times. In resisting, as Elias identifies, they would have essentially gone extinct, as did the knights and the feudal system. This is where interrelatedness is essential. The extinction of the feudal system occurred because the figuration of interrelations, the "organism" that was the feudal figuration, no longer had actors (microorganisms) that were capable of reproducing, adapting, and stabilizing the whole of the connections within the figuration. Like a virus in the body, it exists only when copies continue to reproduce, should the copies be wiped out, supressed, or insufficient, the virus no longer functions. The feudal system and the knight suffered the same fate, individuals could no longer adapt and reproduce as the environment became unsuitable for such a figuration, and therefore failed in the struggle for existence.

Social figurations then, are something like organisms based off of the laws of nature, and are thus equally capable of existence and extinction. Evolution by natural selection only works with the products available, the connections that a social figuration has can be influenced and reshaped, evolving into new social figurations depending on the information pools and the way in which individuals interrelate. Elias made this clear with the *sociogenesis* of the court society. Absolutism is the descendant of feudalism, the court society from the knight society. Social birthing is the result of the ability of the individual actor to manoeuvre within the social figurations that they are entwined in. This is possible because the individual draws and formulates their identities and realities from the multitude of available information pools in their respective society, creating the possibility of modifying their most immediate environment (in this case the court). In doing so, along with environmental influences, slight variations of information are brought into social figurations and reshape its connections, making variations in the practices (think mutation) of the figuration. Depending on the individual actors interpretation of the information, influences such as a king, a high ranking noble, or a charismatic bourgeoisie, and the potentiality they have for bonding, the social figuration begins to reshape, coalescing the interrelated connections upon a new "gravitational point" (like the analogy of galactic filaments above) as more connections are reshaped to account for the change. Over long periods of time, this mutation may eventually become strong enough, the information accumulated sufficient enough, and the connections plentiful enough that a new figuration (a new "species") is "birthed" from the old figuration. This process is exemplified by the feudal and knight figurations in Elias's work. It is during this process that social conflicts arise, this is seen with the noble having to choose irrelevance as a landed feudal based noble or the absolutist-based court noble.

Since humans are a reflective species, the social conflicts that do arise out of competing social figurations can, interestingly, lead to a romanticism of previously successful figurations.[23] In evolution, since nothing is ever completely eradicated, aspects of genetic information survive and are carried forward because all life shares a common source that has evolved over the last 4.1 billion years.[24] In other words, evolution does not rebuild from scratch, it continues adapting with what has already been developed. It is therefore the same for social evolution since social

23 This could be the source of an interesting research project, one that uses the figurational model to identify if the Romantics are a process of figurational change presented here.

24 This date is current as of October 22, 2015.

possibility shares one common source that has been evolving for about 1.8 million years.[25] The information pools we draw from and our interrelated webs of social figurations are bound by the same principles, so our reflexivity is capable of great distance, though usually vicariously skewed. Romanticism can be understood as evolutionary maladaptation on two fronts. The first is what is called "mismatch theory", which states that biological evolution, being slow, is always so behind current environments so that the organism is in a continual state of evolutionary crisis and is constantly having to adapt itself to the present. By the time the adaptations actually occur though, new circumstances have long replaced previous circumstances that affected the adaptation in the first place. This can be seen in the way human beings are very slowly losing their wisdom teeth. Useful for larger mouths and rawer diets, they are completely useless today. Since our social evolution follows the same principles, romantic notions of the past could be categorized as mismatch theory manifested by conscious reflection because our information pools, with the remnant information from past figurations, will no doubt be skewed due to present information conflicts, creating a more romantic image than what really was.

The second cause of romantic maladaptation could be the result that information in the pools are consistently chaotic, so individuals are continually working through information conflicts. Some information in the pools become old, irrelevant, or is simply wrong, while some information becomes so successful that social figurations affected by that information develops healthy and lasting connections.[26] Romanticism not only conflicts with information pools, creating conflict with present environments, it also contains wrong information such as the particular focus that nobles paid towards nature and a free life, leaving out the less desirable aspects such as increased disease and war. Romanticism has, according to Elias's study, and quite visible today, been a continual aspect of social consciousness throughout much of what Elias calls the "civilizing process" (2006). Civilization has no doubt brought an exponential increase in social developments, causing information pools and their networks to be born, adapt, conflict, and die, at ever increasing rates.

By way of summary, the processes described in this section will be applied with Elias's last chapter on the *sociogenesis* of the French Revolution. Elias writes:

> Quite often such violent outburst can be understood only by paying attention to the long-term shifts in the centre of gravity of the society concerned, which proceed slowly, over long periods in very small steps – so that both the people concerned and later generations looking back usually see only isolated symptoms but not the long-term change in the distribution of power as such (2006:286).

The court nobles, living in the last decades of the eighteenth century under the rule of King Louis XVI had, through the continual struggle for survival, become stagnant and began to decline. The struggle for survival amongst the nobility was being overshadowed by the continually successful bourgeoisie. From Henri IV, the birth of the bourgeois figuration had continually grown in power as their wealth, liberal mindedness and socially conscious figurations adapted and evolved. The gravity of connections in the social figurations of the court society had slowly begun to shift, as the nobility, even though of a higher social class, had never been able to successfully restore their power positions from the increasingly present bourgeois positions, thus these two figurations became in conflict in the struggle for survival.

By the time of Louis XVI's rule, the once monitored equilibrium had become self-regulating (Elias 2006). As a result, the king was no longer needed to the extent

25 This date is significant for two reasons. First, it is believed this is when the *Homo* genus begins to populate at an expanding rate. Second, because of the population growth, they begin to migrate out of Africa and divide into never before established groupings.

26 Richard Dawkins believes this is what religion has done.

that maintained the equilibrium of the interrelated network of the court society. The king's distance was no longer capable of manipulating the court in his favour and this created frequent fluctuations in the balance of power. The nobility's and the king's figuration, so bound by traditions of etiquette and ceremony, was growing disadvantageous in adapting against the fitness of the new bourgeois figuration that was matching the wealth and power of even the highest-ranking nobles. The elites and royal family were imprisoned by the bonds of their interdependence, unable to adapt as the external environment altered faster than they could adapt. The "people", being in the same social figuration of the "Third Estate" as the bourgeois, attached on mass to the rapidly growing bourgeois figuration on promises of "*liberté,* égalité*, fraternité"*. This drastically increased the strength and fitness of the bourgeois figuration that had been developing since Henri IV. The powerful bourgeois figuration was beginning to overtake the figuration of the court society –social drift was beginning. Like an antibody on a virus, the bourgeois figuration attacked the competing court figuration and thus began the French Revolution.

Conclusion

My hope here is to have provided a unique take on how to think about social figurations using the laws of nature established by the natural sciences. Elias writes,

> A figuration of interdependent people, can be determined with almost the same rigour as that of a specific molecule by a scientist... Any field of rule can be represented as a network of interdependent people and groups acting with or against each other in certain directions (2006:129).

Expanding on Elias's thought, a molecule is a network of atoms that form only if the atoms are bondable. Should a particular atom not attract properly to the forming molecule, it will be repelled. The information pools that inform social figurations act in a similar way – humans pull from information pools, informing identities and realities through social construction, informing how one latches onto specific networks of interrelatedness. This is why one does not see a Marxist rallying for neo-liberal market freedoms, there is no possible way for a bond to form because that particular information pool informs the way particular networks are shaped, thus informing the individuals figurational shape, what they bond with, and what they repel against.

This study has introduced natural selection at an elementary level in hopes of inspiring further study in the field to better integrate the works of the social and natural sciences, while also demonstrating the folly of deterministic or reductionist arguments – evolution is constantly adapting and reshaping, nothing is set or determined. Evolutionary social science was presented in an introductory format to provide a framework which evolutionary biology works through, furthering the understanding of the shape and flow that evolution allows the social. This demonstrated the way in which each culture, each pool of information, though originally from one source, will develop like a great tree with its own unique evolutionary branch. Norbert Elias's *The Court Society* was examined through introduction of the key components that highlight the structure of Elias's proposed framework of interrelated figurational networks. Finally, in applying Elias's framework to the processes of social evolution by natural selection, a more holistic and multi-dimensional model was proposed. This new model provides greater definition to the way that the networks of interrelated figurations of peoples and ideas evolve over time and act and function like a living organism, affected by wide range of inputs by extension of the fact they are hereditary products of living organisms themselves. This work is not meant to be definitive, but it is meant to inspire inquiry on the validity of evolutionary accounts of socio-historical processes and whether such as study, as presented here, can enrich our understanding of the social as I believe it does.

In thinking of the shape of networks in such a way, along with the maneuverability that an individual brings to the network through conscious reflection, one can understand the complexity of the model that Elias was suggesting, and I have put expanded upon and forward. The field becomes a multi-dimensional network that the big historian or historical sociologist can study, considering the interconnected web that is formed by social phenomena. Though sociologists still resist the application of evolutionary biological processes, I think it is made clear through the example of Elias's, *The Court Society*, how evolution can enrich social science and humanities research. In opening up the social sciences to the processes of nature a new understanding of interrelatedness emerges. A connection to not only the grander scale of the cosmos as a whole, but a more intimate connection with the realities and experiences we as human beings share with the natural world.

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A Evolução de Construtos Sociais: Uma proposta de reconceitualização da sociobiologia para a compreensão de redes sociais interdependentes como "organismos" em evolução usando *A Sociedade de Corte*, de Norbert Elias

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Resumo

A aplicação, por sociólogos, do conceito de evolução por seleção natural tem encontrado forte resistência desde Herbert Spencer (1820-1903), marcada por noções obscuras de poder e de autoridade associadas a uma aplicação acrítica e entusiástica da seleção natural a noções elegantes de raça e privilégio. *Sociobiology* (1975) de E. O. Wilson (1929-) tentou reacender as possibilidades do discurso evolucionário empregando a genética moderna na compreensão dos sistemas sociais, mas foi obstado pelo legado das questões de raça e por noções liberais de "determinismo genético". Neste texto, o arcabouço sociobiológico é reimaginado através de sua extensão, partindo de mecanismos comportamentais e genéticos individuais para a figuração social de redes de atores em larga escala. Empregando as ferramentas conceituais e a análise histórica de Norbert Elias em *The Court Society* (1983), detalhando a corte de Luís XIV e a interdependência entre seus membros, sugerirei que essas redes de interdependência compostas por atores individuais são facilitadas e constrangidas pelo processo de seleção natural, de modo que podem ser analisadas neste sentido. O emaranhamento de dependências criadas pelos atores nessa rede produz pontos de "aglomeração" que identificam a forma das redes e sua função como "organismo social". O que se ganha em compreender a fluidez orgânica das redes sociais, o modo pelo qual são formadas, moldadas, desenvolvidas, e a maneira pela qual conflitam com figurações sociais concorrentes, pode prover uma forma nova e naturalmente derivada de interpretar as redes de atores sociais interdependentes, e oferecer uma maior profundidade na conceitualização das relações sociais humanas. Por fim, uma visão da história e da sociologia como essa pode se alinhar aos princípios da Grande História através da compreensão do sujeito humano como atrelado aos mesmos processos de desenvolvimento que se impõem a todas as formas de matéria no Universo pelos últimos 13,8 bilhões de anos.

Palavras-chave

Evolução; Sociobiologia; Sociologia; História; Rei Luís; França; Revolução Francesa: Norbert Elias; Sociedade de Corte; Redes Sociais; Interdependência; Seleção Natural.

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Introdução

O cientista social, especificamente o sociólogo, tem um papel peculiar a representar no mundo acadêmico contemporâneo. Atrelado à gênese de uma disciplina e de suas tradições, o sociólogo continuamente orbita ao redor da noção de estudos científicos, objetivos e empiricamente embasados. Isso é facilmente observável, uma vez que muitos artigos sociológicos contemporâneos são elaborados de maneira similar à da pesquisa nas ciências duras, citando modelos de regressão, pontuações médias, e uma miríade de outras ferramentas analíticas

adotadas e adaptadas para propósitos sociológicos. Esses métodos, e o contínuo desenvolvimento de uma pesquisa social cientificamente embasada, são encontrados na obra de pensadores como Auguste Comte (1798-1857) e Émile Durkheim (1858-1917), que clamavam pelo estudo do social através das ferramentas dos filósofos naturais com vista a uma melhor compreensão e, desejavelmente, a uma melhor modelagem da experiência humana.

Desde Comte e Durkheim, trabalhos com profundo impacto têm surgido, e esse impacto se deve não só ao desenvolvimento do pensamento social crítico e ao fato de lançarem luz sobre a condição humana (para melhor compreendê-la), mas também pelas consequências globais de algumas dessas obras. Karl Marx (1818-1883), Max Weber (1864-1920), e Thomas Kuhn (1922-1996), por exemplo, remoldaram o entendimento humano a respeito das classes sociais, do poder, e do avanço científico por meio de um arcabouço de fundo sociológico, fundamentalmente transformando a maneira pela qual a academia e o pensamento popular levam em conta esses assuntos. Marx exemplifica como as ciências sociais têm remoldado coletivos humanos em novas formas sociais e políticas. A disciplina da Sociologia, desse modo, têm tido poderoso impacto global, e a possibilidade de efeitos futuros é quase certa, uma vez que oportunidades e conflitos sociais correntemente incompreensíveis ainda estão por emergir. O fato de a sociologia ter sua gênese nas ciências naturais resultou em uma relação íntima, ainda que contida. Exemplos de desdobramentos negativos de empreendimentos sociológicos são ubíquos no contínuo histórico, mas nenhum deles foi mais destrutivo que a aplicação de um princípio das ciências naturais à condição humana, especialmente no que concerne à publicação por Charles Darwin[1] (1809-1882) de *A Origem das Espécies por meio da Seleção Natural, ou a sobrevivência das raças favorecidas na luta pela vida* (1859). As consequências desse livro foram ainda mais modificadas em 1864, quando Herbert Spencer (1820-1903) publicou o seu *Principles of Biology*, um texto de grande influência que inclui a agora famosa (ou infame) frase, "sobrevivência do mais apto" – uma interpretação da obra de Darwin que se tornou profundamente arraigada na mentalidade popular acerca da seleção natural. A obra de Darwin, seguida pela de Spencer, metaforicamente representa o primeiro fio naquilo que se tornaria uma complexa teia que continuou a ser tecida muito após a publicação de *A Origem das Espécies*, enredando leigos e especialistas indistintamente. O darwinismo social emergiu no esteio de uma então recente popularidade e perceptividade que a seleção natural oferecia. Isso reformulou radicalmente, por exemplo, a percepção das classes sociais, da raça, e das possibilidades da perfectibilidade humana. No século XX, com os avanços da ciência e da tecnologia, e com o impacto psicológico da Primeira Grande Guerra, não seriam a bala ou a bomba a terem o efeito mais profundo no mundo na grande guerra seguinte, mas sim, os programas de eugenia. As consequências da adoção, pela sociologia, dos princípios da seleção natural nunca seria esquecida, e até hoje persiste uma complicada resistência contra as ciências sociais empregando processos evolucionários (Barkow, 2006). A sociologia evolucionária se tornou, desde então, um tabu para acadêmicos e suas instituições, sendo a sociobiologia, por exemplo, um esforço acadêmico marginalizado, alvo de ceticismo e de pesadas críticas. Isso resulta de uma combinação de fatores, incluindo a memória coletiva viva da era da eugenia e a tradição de estudar o social pelo social (Barkow, 2006). Acadêmicos como E. O. Wilson [2] e Jerome Barkow, bem como Carl Sagan e Richard Dawkins, têm advogado em prol das ciências sociais evolucionárias, defendendo suas potencialidades. Meu desejo aqui, então, é o de propor a reintrodução do pensamento evolucionário na sociologia, mas que venha a evitar alegações de determinismo através de fundar-se em uma "ciência" histórica. Acredito que isso seja necessário e que já passe da hora de fazê-lo, dadas as íntimas relações que muito do mundo natural têm revelado por meio dos métodos da ciência, e como

proeminente objetivo da Grande História. Mas, mais do que isso, porque se torna logicamente incoerente sustentar que seres humanos, produtos da seleção natural, não externalizariam, por meio de suas criações, produtos vinculados a sistemas de desenvolvimento naturalmente influenciados. A primeira coisa que farei será prover uma introdução elementar à evolução através da noção de seleção natural de Darwin, seguida por uma introdução à ciência social evolucionária (sociobiologia) utilizando a conceitualização de Jerome Barkow de modo a prover as definições básicas e ferramentas conceituais necessárias para reconfigurar esse conhecimento para um estudo de caso empregando a obra de Nobert Elias (1897-1990), *The Court Society* (2006). O trabalho de Elias provê uma análise detalhada da corte real de Luís XIV (1638-1715) da França durante o século XVII. Nele, Elias oferece uma narrativa rica e detalhada da rede de inter-relacionamentos (figuração) que demonstra a evolução da sociedade de corte pela modelagem, usando metodologias sócio-históricas, da complexa teia que existiu. Empregando *The Court Society* de Elias, mostrarei como uma estrutura social particular e seus atores, especificamente a corte real de Luís XIV, produz sua rede própria e distintamente identificável, cuja manutenção é ativamente resguardada por todos os seus membros, de modo que vem a se constituir como um "organismo" social específico. Isso mostrará que os processos de evolução social não podem ser entendidos através de momentos ou indivíduos específicos, em consonância com o que a Grande História sugere. Essa insensatez conduz ao erro em compreender as complexidades interdependentes das relações sociais e do ambiente a que pertencem. Ao adotar esse arcabouço social sugerido pela Grande História, e ao testá-lo à luz da produção historiográfica, as complexas teias das relações humanas no espaço-tempo [3] podem ser finalmente entendidas de maneira similar às leis da natureza já estabelecidas pelas ciências naturais, permitindo uma mais profunda e mais holística visão da dinâmica temporal dos padrões sociais. Em suma, empregando as ferramentas de uma ciência social evolucionária, agregando e atualizando arcabouço e evidências apresentadas por Elias, será mostrado que adotar princípios evolucionários nos estudos sociológicos abre a possibilidade de que a evolução social seja um verdadeiro caminho de estudo, um prospecto que pode enriquecer a pesquisa ao mais profundamente reconhecer a complexidade em nossa existência social inter-relacionada e naturalmente vinculada.

Evolução por Seleção Natural

Nesse artigo, discutirei a seleção natural com apenas um pequeno toque de genética, uma vez que é dessa maneira que se relaciona diretamente ao tipo de investigação que esse projeto sócio-histórico permite. Enquanto os prospectos de implementar uma síntese moderna nesse trabalho podem ser tentadores, concentrarei minha atenção em aplicar o básico daquilo que Darwin descobriu e sugeriu (os genes) às estruturas sociais da história. Sendo a pesquisa histórica uma construção intelectual feita no presente e não no passado, estarão presentes erros oriundos da desinformação e da subjetividade humana. A precisão a que remete a ciência evolucionária biológica contemporânea somente adicionaria complexidade desnecessária ao meu propósito de prover um exemplo introdutório de evolução social. Peço que o leitor considere esse texto como uma pequena contribuição ao entendimento da história através de um arcabouço sociológico específico, e encorajo-o a refinar e expandir meus resultados. Para nosso propósito, essa introdução se concentrará em três conceitos chave: tempo, variação e ambiente. O tempo, seu significado e amplitude, passaram por mudanças radicais durante o século XIX, sendo influenciado por campos como o da paleontologia e da arqueologia, por descobertas de fósseis de dinossauros e antigas civilizações perdidas (Stewart, 2011). Dadas as recentes evidências fósseis e arqueológicas, torna-se crescentemente claro que espécies a muito extintas apresentam marcantes similaridades com espécies estantes que povoam a

Terra. Os aspectos mecânicos e físicos de fósseis botânicos, e de espécies aquáticas e terrestres, compartilham de similaridades impactantes com aspectos análogos em espécies contemporâneas, o que levou Darwin e Wallace a concluir que as espécies estantes estariam necessariamente relacionadas àquelas antigas; similaridades centrais estariam mascaradas por óbvias diferenças, como resultado do tempo.

As variações eram, e ainda o são, muito popularizadas pela referência, feita por Darwin, aos tentilhões das Ilhas Galápagos. Tentilhões em várias ilhas do arquipélago de Galápagos possuem pequenas variações, comumente identificadas a partir de seus bicos. Algumas são substanciais enquanto outras são menos sensíveis. Ainda que estruturalmente se tratem do mesmo pássaro, as formas do bico, juntamente com variações em cor e tamanho, estão consistentemente isoladas em cada ilha, sendo esse um achado também verificado em outras espécies (Darwin, 1959). Darwin concluiu que a única maneira pela qual essa dispersão de padrão de variação podia ocorrer seria através de uma herança legada através de gerações no tempo (Darwin, 1959) [4]. O processo de hereditariedade estabelece que traços específicos dos genitores sejam transferidos à sua prole. Desse modo, as variações entre os tentilhões observados por Darwin em cada ilha eram traços levados adiante por meio do processo de reprodução (Darwin, 2003). Por que os tentilhões variariam de ilha para ilha? Por que se tornariam pássaros aparentemente diferentes? Darwin, e Wallace em seus próprios estudos, encontraram inspiração em um escrito de Thomas Malthus (1766-1834) chamado *Um Ensaio sobre o Princípio da População* (1797). Esse trabalho econômico detalhava o choque entre crescimento populacional e a sustentabilidade dos recursos, especialmente alimentares. Malthus conclui que as populações cresceriam exponencialmente enquanto os recursos alimentares apenas se desenvolveriam em taxa uniforme. Isso significava uma inevitável luta pela sobrevivência humana a partir dos recursos, enquanto populações, e em última instância mesmo civilizações, colapsariam caso o crescimento demográfico superasse a capacidade de autossustentação dada pela oferta de recursos disponível. Tanto Darwin quanto Wallace acreditavam que o trabalho de Malthus, voltado para o discurso político e econômico, tinha na verdade aplicação ao ambiente natural (Darwin, 2003). Observando que espécies comuns e abundantes como vermes e besouros não haviam tomado o planeta, a totalidade do meio ambiente deveria estar afetando a capacidade de reprodução dessas espécies, criando sistemas tanto de necessidade quanto de aleatoriedade. Darwin notou que recursos alimentares eram diferentes dependendo de cada ilha. A variação distinta entre os bicos dos tentilhões não era aleatória, mas necessária para a sobrevivência no ambiente específico de cada ilha (Darwin, 2003). Onde o alimento era mais macio e requeria menos bicadas, os tentilhões tinham bicos menores; onde o alimento era mais rígido e exigia mais força, bicos eram mais substanciais. Desde *A Origem das Espécies*, muita coisa se tornou clara a respeito dos mecanismos que envolvem e estão por detrás da seleção natural [5], especificamente no que tange os genes. O ser humano possui algo em torno de 24 mil genes [6], cada qual sendo um pedaço de informação em uma sequência de nucleotídeos [7], e cada qual sendo uma possível unidade de hereditariedade (Barkow, 1989). Juntos, esses nucleotídeos formam uma cadeia molecular de ácido desoxirribonucleico, ou ADN, a hélice dupla. Um único gene não provê informação para uma parte específica do corpo; ao invés disso, múltiplas proteínas trabalham juntas para prover informação para certos traços ou partes. Metade dos genes na hélice não são diretamente responsáveis por qualquer informação particular, e sim se comunicam paralelamente com outros genes, funcionando como um interruptor de modo a ligar ou desligar certa informação[8].

O fenótipo, ou os traços herdados e descritíveis de

um organismo, são tanto um produto da informação dos genes quanto do ambiente a que esses genes pertencem. A informação dos genes é criticamente afetada pelo ambiente físico externo e interno, por meio de um processo de troca altamente complexo. Por exemplo, fatores como luz, som, calor, hormônios, e componentes químicos estranhos ao organismo, podem todos contribuir para alterações nos genes ou no genótipo (uma sequência de genes), alterando a informação transmitida e consequentemente o fenótipo como um todo (Lobo, 2008). Essa é uma descrição mais técnica do que aquela que Darwin e Wallace descobriram e sugeriram [9], mas o conceito central é o mesmo. A transmissão de informação dependente da sequência genética e do ambiente físico leva à evolução através de lentas adaptações e transferência hereditária.

Ao entender os genes e as influências que o ambiente exerce, se torna claro que o processo de mutação é um dos principais componentes que permitem o funcionamento da evolução por seleção natural. A dupla hélice, ADN, é constantemente partida ao meio e copiada por uma complexa molécula chamada replissomo; mas a cópia nem sempre é perfeita, e a informação genética pode passar por ressequenciamento alterado em comparação com o código original. Como resultado, isso pode mudar tanto uma proteína quanto vastas seções da sequência – essa é a base da mutação. Na linha germinal [10], uma mutação pode resultar de hereditariedade (tendo sido legada por uma geração ou mais), ou por efeito somático (ocorrido em qualquer momento da vida de um organismo). Por vezes uma mutação ocorre e garante uma vantagem para a espécie, tal como um bico mais substancial; como resultado da seleção natural por meio da vantagem ambiental, uma mutação como essa pode se tornar um traço bem sucedido.

O resultado de tal sucesso permitiria a um organismo ter o que se chama de *fitness* genético, uma posição vantajosa que determinado genótipo garante a uma espécie. Desse modo, a nova espécie se tornaria reprodutivamente mais próspera por meio de desfrutar de uma vantagem em termos de sobrevivência. A nova vantagem, e um maior sucesso reprodutivo conduziriam a maior capacidade de sobrevivência da nova sequência genética que excederia aquela de que dispunha a sequência pré-mutacional. Por meio do processo de seleção natural, essa nova e bem-sucedida sequência genética sobrepujará a antiga, no que se chama deriva genética.

Sociobiologia, ciência social evolucionária e integração compatível

Um simples gene não determina os desdobramentos da evolução em um organismo individual; ao invés disso, um gene troca informação com outros genes que são afetados por múltiplos fatores internos e externos. Esse processo é bastante similar ao de navegação nas experiências sociais (Elias, 1991). Barkow sugere que esse é o mecanismo de expressão genética, ao meio caminho entre os genes e seus comportamentos respectivos, que evoluíram ao longo to tempo em resposta à adaptação, e aos quais as ciências sociais evolucionárias devem direcionar seu foco (2006). Expressões desses mecanismos vão desde papéis de gênero à organização de identidades. O estudo desses mecanismos, diz Barkow, rompe com argumentos simples de causa e efeito, permitindo a cientistas sociais estudar a profundeza daquilo que conecta a causa *x* ao efeito *y* (2006). Em suma, um estudo como esse deveria analisar a complexidade das relações interconectadas que envolvem as circunstâncias internas e externas. Por exemplo, nossa capacidade de navegar por uma variedade de culturas, ou de autocontrole em ambientes sociais é, de acordo com a sociobiologia, o produto de processos evolucionários que facultam a adaptação a ambientes culturais, uma vantagem para uma espécie cultural como *Homo sapiens*. Nosso sistema nervoso central, um produto da evolução em si mesma, desenvolveu os mecanismos necessários para que naveguemos por diferentes culturas. Essa é

a nossa psicologia com base evolucionária (Barkow, 1989). Ou, de forma mais simples, nossa natureza humana.

Para a sociobiologia, a natureza humana equivale a culturas dinâmicas. Cada cultura desenvolverá sua própria psicologia evolucionária, sua própria natureza humana, de uma forma completamente diferente de qualquer outra cultura. As diferenças entre culturas não tem nada a ver com uma hierarquia de desenvolvimento. Tecnologia e ciência, por exemplo, não equivalem a uma cultura em estágio mais alto de desenvolvimento, tudo que fazem é transformar o ambiente singular através do qual alguém precisa navegar. A navegação através da cultura só é possível por meio do aprendizado, ocorrendo de forma individual ou coletiva. Quando o aprendizado individual se torna suficientemente eficiente para que terceiros dele se beneficiem, o aprendizado social passa a ocorrer, e, por meio de troca geracional de informações, cria-se a cultura (Barkow, 2006). Cultura, como diz Barkow, é o conjunto de recursos de conhecimento disponíveis a que um indivíduo pode acessar, e através do qual ele pode navegar (Barkow, 2006). Culturas não são estáticas, de modo que estão constantemente em adaptação. Um indivíduo pode recorrer a múltiplos reservatórios de cultura, e a globalização é um exemplo de múltiplos reservatórios de informação sendo acessados, algo que, por consequência, conduz a culturas em transformação. Como uma espécie, somos inerentemente dependentes desses reservatórios de informações, dado que *Homo sapiens* é a única espécie que requer aprendizado por tanto tempo e numa extensão tão íntima ao longo de sua vida. Continuamente moldamos nossas identidades e instituições, nossas próprias realidades, a partir de um construcionismo social não radical, a partir dos reservatórios de informação disponíveis (Barkow, 2006). Culturas não apenas moldam indivíduos, mas são também moldadas por indivíduos em seu processo de adaptação a ambientes cambiantes. A habilidade para "editar" a cultura só é possível dada a natureza dessa relação entre o indivíduo e o ambiente. A edição cultural provém do desejo de alcançar uma realidade social diferente, como a que provém da mudança de *status* de classe (Barkow, 2006).

Adotando a evolução nas ciências sociais, Barkow afirma o que chama de integração compatível ou vertical (Barkow, 2006) [11]. Integração compatível é a habilidade pela qual as disciplinas compartilham um consenso acerca de pesquisa e teoria reconhecidas. Por exemplo, no campo das ciências naturais, as teorias químicas empregam tanto a física quanto a biologia. Adotar uma posição similar permitiria às ciências sociais um estudo mais holístico, com cada ciência social contribuindo de forma disciplinar específica e ainda assim voltada para um todo maior. Barkow identifica três vantagens distintas em adotar a integração compatível. Primeiramente, selecionar teorias que perpassem disciplinas permitiria aos cientistas sociais serem treinados de uma maneira mais tópica, aprendendo temas e teorias de forma transversal às disciplinas (Barkow, 2006). Isso permitira ao cientista social observar o problema de forma mais robusta, enquanto também facultaria análise crítica em áreas que correntemente são incompatíveis entre as disciplinas. Em segundo lugar, uma relação mais estável e compatível com as ciências naturais (Barkow, 2006). E, finalmente, ao treinar cientistas sociais em integração compatível, esse treinamento seria mais interdisciplinar, como o de um biológico que requer os saberes da química e da física (Barkow, 2006). Como nas ciências naturais, o domínio de tudo não é necessário, mas a compreensão é essencial.

Ao introduzir aqui tanto a biologia evolucionária quanto a ciência social evolucionária, meu objetivo é o de demonstrar que ferramentas de pensamento como essas não são determinísticas ou inerentemente malévolas, supostamente revelando a superioridade de uma cultura ou etnia em relação à outra. Mas de fato estabelecem que cada espécie, cada cultura, em sua condição de expressão singular daquilo que a

evolução permite, devem ser entendidas e estudadas como expressões únicas das possibilidades legadas por aqueles mecanismos evolucionariamente desenvolvidos com o que foi brindada a nossa espécie. Isso oferece uma nova compreensão para o fato de que a evolução da espécie humana não está estritamente vinculada à genética, mas é também moldada externamente, permitindo modificações às nossas realidades sociais. Como a evolução biológica, a evolução social está constantemente se adaptando a novas circunstâncias na medida em que novos reservatórios de informação instruem novas redes de interrelacionamentos, imitando o efeito ambiental sobre os genes. O ser humano se torna o micro-organismo que forma um ponto singular de enlace na rede de interrelacionamentos (muitos pontos), formando um "organismo" inteiro da realidade social. Dessa forma, pode-se compreender como indivíduos se inter-relacionam com instituições, criando complexas redes que produzem seu tipo exclusivo de "fenótipo". Isso será desenvolvido mais adiante.

A Sociedade de Corte

The Court Society, publicado em 1969, representa uma excelente introdução aos processos de pensamento que Elias produziu a respeito da estrutura e da agência, e das relações de que compartilham esses dois processos. No caso particular de *The Court Society*, Elias usa a corte real do Rei Luís XIV como ponto central em seu modelo figurativo, mas a seleção dos tópicos é importante em si mesma por algumas razões. A mais simples delas está em que o reinado de Luís XIV é considerado geralmente como "começo do fim" tanto do governo dos reis de França quanto do que se conhece por monarquia absolutista [12], que se notabilizou justamente em território francês. A segunda razão está em que os reinados de Luís XIV a Luís XVI foram notórios pelas grandes indulgências e gastos desenfreados. O *Château de Versailles* é um produto dessa era, a maior e mais elegante residência real jamais construída – um testamento daquele tempo. O desejo de Luís XIV pelo poder e riqueza material levaram à bancarrota da França através de guerras contínuas e indulgências, perpetuadas por uma nova economia monetária. E finalmente, e mais importante para os meus propósitos, esse momento particular no espaço-tempo destaca a importância da singularidade da Grande História, uma vez que falham os métodos de pesquisa da história tradicional ao tenderem dar foco a indivíduos e suas ações, e não às influências mais amplas da comunidade e do ambiente. Luís XIV pode ter sido uma figura importante na França, mas ele está longe de ser um centro de gravidade estático, como será mostrado.

Esse é fundamento de *The Court Society*, de que não é um momento singular, nem um indivíduo em particular, a causa da história. Essa é uma falácia muito comum e produto da disciplina histórica carente de uma perspectiva sociológica (ou macro-histórica). Elias diz:

> Sem a análise sociológica da estratégia específica que um soberano como Luís XIV usava para preservar a liberdade de ação e a margem de manobra da posição de rei, sempre ameaçadas, e sem a elaboração de um modelo de figuração social específica dos homens que tornavam possível e necessária a estratégia do indivíduo singular na posição de rei, caso este não quisesse perder o grande jogo, o procedimento do soberano individual permanece incompreensível e inexplicável. Com isso, a relação entre as questões colocadas pelo sociológico e pelo historiador torna-se um pouco mais clara (Elias, 2001: 29) [13].

O historiador, em busca da cronologia, consistentemente deixou para trás o enquadramento do sociológico, pondo foco na "série de acontecimentos

únicos do passado" (Elias, 2001: 29). Isso, de acordo com Elias, resultou em uma "renúncia (...) a uma investigação sistemática das posições sociais (...) e (...) também a uma investigação das estratégias e possibilidades (...). [Isso] conduz a uma abreviação e restrição características da perspectiva histórica" (Elias, 2001: 30). Essencialmente, o historiador não emprega modelos de estudo, e, ao invés disso, "O nexo dos fenômenos singulares permanece, em larga escala, a cargo de interpretações arbitrárias e, muitas vezes, de especulações. É esse o motivo pelo qual não há propriamente, na ciência histórica (...) nenhuma continuidade de pesquisa" (Elias, 2001: 30).

Por outro lado, a sociologia está também em uma em posição de ter uma "perspectiva restrita" porque os trabalhos sociológicos comumente carecem de profundidade histórica e dão foco quase que primariamente aos sistemas, deixando para trás o individual. Elias diz: "A maneira pela qual certos sociólogos concebem seu trabalho leva a pensar que eles se ocupam exclusivamente de figurações, e de figurações sem indivíduos" (Elias, 2001: 52). Uma simples analogia para que visualizemos isso pode estar na teia da aranha. Quando olhamos para a teia da aranha, se tudo que vemos é a teia em si mesma – os fios de seda adesiva que formam a estrutura – então a invisibilidade da aranha ou da mosca capturada, talvez mesmo dos ramos da árvore onde foi tecida, desvaloriza todo o estudo grandemente, reduzindo a visibilidade total pela qual o sociológico pode "ver" a integral figuração na qual o ambiente, a teia, a aranha e suas vítimas se inter-relacionam.

O que se requer então é uma abordagem através da Grande História – uma combinação de história, sociologia, e nesse caso, de ciências naturais. O estudo da história, com seu foco nas particularidades, como os indivíduos e o "único e irrepetido", é utilizado como evidência para o teste de arcabouços sociológicos com foco em figurações. A pesquisa sócio-histórica resultante criaria as ferramentas necessárias para se perceber como indivíduos são moldados por figurações e também como indivíduos moldam essas figurações. Nesse sentido, o campo não é mais um plano bidimensional de simples causa e efeito, tal como aquele em que opera a história, nem é um estágio desprovido de atores, como aquele em que a sociologia opera. Torna-se um modelo multidimensional de fios interdependentes, criando uma vasta e complexa rede [14]. As formas pelas quais atores independentes são vinculados uns aos outros resultará do acúmulo de conexões dependendo da informação disponível, de influências particulares, do ambiente, e da estrutura que se está estudando. A concentração de conexões será moldada unicamente dependendo da figuração (de que estrutura está sendo observada), tornando-se o ponto crítico de estudo para o pesquisador, e informando a maneira pela qual a estrutura será moldada bem como seus fluxos, enquanto também ilumina as relações compartilhadas pelos atores em seu interior.

Elias começa seu estudo com as estruturas físicas que a nobreza ocupava, suas residências, ou *hôtel*. A arquitetura tinha duas funções críticas. Primeiro, a sinalização que a exibição da residência tinha para uma família [15]. A riqueza material em demonstração era crítica na manutenção da posição social de um indivíduo para o consumo conspícuo e essa exibição diretamente reforçava *rank* e título, capazes de impulsionar o *status* de uma "casa" [16]. A segunda função é o fato de que era a representação física da sociedade de corte do rei, apenas em uma forma menor. Essa era uma tentativa não apenas de copiar a elegância da mansão real, mas também de se tornar, de alguma forma, de incorporar o poder do rei. O aposento principal e maior era o grande *hall* onde os nobres de uma determinada casa dariam festas, como salões, e gerenciariam seus assuntos. Esses eram criticamente importantes para a família, uma vez que tais funções sociais eram demonstrações de riqueza e instâncias de obtenção de *status*.

Os quartos de dormir do senhor e da senhora seriam separados, representando a grande distância social que era costumeira na sociedade de corte. A senhora e o senhor de uma casa poderiam passar dias sem sequer se verem dado que os círculos sociais eram tão amplos e variados, e a manutenção desses ditos círculos era da maior importância. Essa separação era informada pelo objetivo estrito de melhorar o *status* social da casa. Essa distância social era importante tanto para o nobre em sua casa como para o rei na sua. Permitia ao senhor de uma casa controle do ambiente imediato ao conduzir os convidados nobres para o benefício social do mestre.

Para o rei em sua casa em Versalhes, esse controle era uma versão maior e mais extravagante do que os nobres tinham imitado. A corte do rei:

> (...) representava para ele (...) o espaço de atuação primordial e imediato, enquanto o país era o espaço secundário e indireto. Tudo (...) tinha que passar pelo filtro da corte antes de chegar ao rei; e tudo o que vinha do rei tinha que passar pelo filtro da corte antes de chegar ao país. Mesmo o monarca mais absoluto só podia atuar sobre o seu país através da mediação dos indivíduos que viviam na corte. Assim, a corte e a vida na corte constituíam o local originário de toda a experiência, de toda a compreensão do homem e do mundo por parte do rei absolutista do Ancien Régime. Por isso, uma sociologia da corte é, ao mesmo tempo, uma sociologia da realeza (Elias, 2001: 66-67).

A condição de mestre da casa é essencial para começarmos a compreender a maneira pela qual a posição do rei é somente assegurada por aqueles que vivem e agem ao seu redor. Luís XIV não era capaz de governar a França sem a mediação das pessoas da corte, nem essas pessoas estavam em posição de ser uma nobreza, e desse modo pessoas da corte, sem o rei. A dependência da nobreza em relação ao rei e vice-versa [17] é o resultado de uma "figuração específica que os muitos indivíduos formam conjuntamente, e com as interdependências específicas que os ligam uns aos outros" (Elias, 2001: 85). A figuração da corte [18] garantia que o consumo conspícuo era necessário em manter a posição social de um indivíduo uma vez que os nobres disputavam por *status* uns contra os outros. O que parecia indulgência a qualquer pessoa externa à figuração da corte [19] era em verdade similar em todos os sentidos a um burguês acumulando capital e poupando para investimentos futuros na classe trabalhadora desejosa por salários (Elias, 2006). Os meios de manter o *status* de um indivíduo e sua capacidade de sobreviver eram diferentes, mas o objetivo era o mesmo (Elias, 2006).

Para um nobre da corte, sua racionalidade e a necessidade de consumo conspícuo de modo a manter ou melhorar sua posição social, era algo crítico para a conquista de *status* contra seus rivais. A opinião dos membros da corte era um "instrumento de formação e controle", ao qual "nenhum de seus membros podia escapar (...), sem pôr em jogo sua qualidade de membro e sua identidade como representante da elite, parcela essencial de seu orgulho pessoal e de sua honra" (Elias, 2001: 113). Famílias estavam constantemente subindo e caindo nessa figuração altamente competitiva. Para garantir a posição de alguém, e esta posição em superioridade à de outros, a opinião era moeda de troca da mais alta importância, então o consumo conspícuo era essencial em manter uma bem posicionada opinião na luta por *status*. Por outro lado, isso forçava uma dependência maior em relação ao rei, uma vez que estar próximo dele, e em sua graça, era a mais vantajosa e prestigiosa posição. Garantia o mais alto em poder de compra e reputação. Agir em concordância com as práticas da corte era

essencial para alcançar esse patamar. Etiqueta e cerimônia eram a mais importante das práticas sociais na corte, e em lugar algum isso era mais proeminente que no *Château de Versailles*. A *revée* do rei, seu despertar matinal, era uma manobra excessivamente complexa de seis grupos sociais diferentes, desde os altos senhores aos convidados, passando mesmo pelas crianças bastardas, cada qual tendo uma ordem e função particular nesse complexo ritual de *status*. Cada um dos seis grupos tinha um diferente nível de prestígio, e neles, os nobres lutavam continuamente entre si para galgar degraus acima. O reconhecimento do rei garantiria, temporariamente, uma posição mais estável e destacada para o nobre e sua família. O rei intimamente sabia disso e mantinha distância para garantir que a nobreza não se tornasse complacente e continuasse sua luta. Distância social era produto da etiqueta e cerimônia da sociedade de corte em si mesma, pelo requerimento da distinção. Elias diz que praticar a distância levava os membros da corte a aprimorar suas habilidades de observar e de lidar com outros cortesãos, bem como a restrições pessoais no âmbito da racionalidade de corte. A distância social requeria a formulação de estratégias para o progresso, seja pela formação ou pela destruição de alianças, pela manipulação, ou outras tantas táticas. Não obstante, como Versalhes e o *hôtel*, a distância social do rei era ampliada em dose ainda maior. Foi a distância social do rei em relação à sua nobreza que os colocou uns contra os outros no afã de se tornarem mais próximos do monarca. Como mestre da casa e da corte, o rei observava e manipulava os membros de sua corte para engrandecer seu poder e glória [20], usando etiqueta e cerimônia como seus principais instrumentos.

Era a tradição da corte que fazia a distância e a etiqueta e o cerimonial tão essenciais. A constante ascensão e queda das famílias da corte significava que a tradição era o que garantia que tais práticas existissem e fossem mantidas independentemente de quem residia na corte; tornava-se um tipo de dança no qual apenas os novos membros que melhor e mais rapidamente aprendessem os passos poderiam sobreviver. Entretanto, a tradição não era estática, e evoluía com cada novo rei e corte. Elias sugere que a natureza aristocrática da França de Luís XIV começou na Idade Média com uma história marcada por conflitos entre o monarca e a crescente nobreza (2006). A forma de governar tão extravagante de Luís XIV começou a florescer sob o reinado de Henrique IV. Henrique IV era o que Elias chama de último dos "reis cavalheirescos", dadas as suas relações de proximidade com seus nobres, significando uma menor distância social para as manobras da corte (2006). A mudança para um reinado baseado em uma corte mais aristocrática, como sob Luís XIV, repousou sobre a economia monetária ainda em desenvolvimento desde Henrique IV. Antes do absolutismo havia um sistema feudal (ao tempo de Henrique IV), no qual os altos senhores estavam encarregados de seus próprios exércitos e de vastas parcelas do estado. Jurando lealdade ao rei, prometiam a ele seus exércitos quando convocados, e tal arranjo significava uma proximidade maior e uma relação mais íntima. Essa é em parte a razão para a história de tensões entre as grandes famílias e a família real na França, tensões conhecidas bem por Luís XIV em sua juventude. Com o comércio em crescimento, e as entradas de ouro, prata e outros materiais preciosos, a economia começou a crescer drasticamente. Pela primeira vez na história, o rei dispunha de riquezas para comprar um exército inteiro para si. A industrialização das armas de fogo tornou os cavaleiros irrelevantes [21]. Armamento barato e de fácil treinamento e a ampla oferta de homens capazes em busca de salários se tornou o novo padrão. A palavra "soldado", do francês *la solde*, significando "dinheiro", claramente alude a essa história.

O crescente volume de dinheiro fluindo para a França e para o rei reduziram a habilidade dos nobres de obter ganhos a partir do compartilhamento de responsabilidades como a guerra e a agricultura. O rei podia agora possuir e suprir a si mesmo independentemente, de modo que começa a declinar a nobreza. Tendo sido por séculos responsável pelos exércitos e pela terra, a nobreza era colocada pela nova economia monetária em uma posição de ter de

escolher entre resistir ao seu declínio, potencialmente diminuindo sua posição social relativamente ao rei (como resultado de não vir dinheiro do rei para suprir os exércitos particulares dos nobres) ou adaptar-se por meio do movimento em direção a uma relação de mais centralidade e dependência com o rei e sua corte. Daí vieram as pensões, dádivas monetárias, e outras recompensas provenientes do rei, começando com Henrique IV e se tornando tão vital no tempo de Luís XIV. A inabilidade dos nobres de suster economicamente suas posições de privilégio significava que essas dádivas eram necessárias para a sobrevivência, tornando-se então símbolos de boas relações com o rei, e apertando a interdependência da figuração de corte. Consequentemente, a dependência da nobreza em relação ao rei para status e riqueza fez o rei o rei igualmente dependente da nobreza, dado que as necessidades daqueles perpetuavam o poder absoluto deste.

A mais importante mudança trazida pela nova economia monetária foi o crescimento rápido da burguesia enriquecida. Sua nova riqueza, do comércio e dos serviços, fluía da França, da Europa, e crescentemente da economia global. Sob Henrique IV, devido à necessidade que tinha da riqueza dessas novas classes, abriu-se a compra de cargos de poder à burguesia, o que ameaçou fortemente a já atormentada nobreza. Durante o reinado de Luís XIV, o rei ficou em dívida com a nobreza pelo seu governo absoluto, e a nobreza em dívida com o rei pelo status e pela riqueza, enquanto a burguesia rapidamente cresceu em riqueza, poder e influência, fora da figuração da sociedade de corte. A nobreza, em constante conflito interno, logo estaria em competição com a alta burguesia. A confrontação combinada entre os membros da corte e o rei criou um equilíbrio delicado na disputa por status e poder. Então, "É essa balança das interdependências, essa defesa do equilíbrio das dependências que dava o caráter específico disso que denominamos 'corte'" (Elias, 2001: 212).

À medida que a burguesia continuava a crescer em riqueza e poder, o declínio da proeminência dos nobres, e dado que os seres humanos são reflexivos, conduziu a uma romantização de um passado nobiliárquico de mais poder. Os senhores feudais do passado eram, aos olhos de seus descendentes da corte, próprios de um lugar de "natureza", mas próximos da produção de alimentos, das árvores, das montanhas e dos rios. Elias escreve:

> O passado assumia o caráter de uma visão onírica. A vida no campo se torna um símbolo da inocência perdida, da simplicidade e naturalidade espontâneas; torna-se o contraponto da vida urbana e de corte, com todos os seus vínculos, suas complicadas coerções hierárquicas e suas exigências de autocontrole de cada um (Elias, 2001: 200) [22].

Com a evolução da nobreza ao longo de gerações, certas funções às quais estavam acostumadas, que davam às suas vidas sentido e valor, foram perdidas. Aqueles pertencentes à nobreza e que podiam se adaptar às suas posições em transformação se tornaram "envolvidos em uma rede de interdependências mais abrangente e mais rígida" (Elias, 2001: 224). Isso requeria mais autocontrole, mais disciplina, e menos liberdade. Elias usa memórias de membros da corte da França, Alemanha, e Grã-Bretanha, para mostrar que as mesmas atitudes de nostalgia por um passado mais simples e livre existiram transversalmente a várias sociedades aristocráticas (2006). Elias conclui que o contínuo processo civilizador das sociedades, que conduziu a mais estrutura, mais urbanização e industrialização, e menos autocontrole, levou as pessoas a sonhos de uma "uma vida mais livre, simples, natural, menos pressionada pelas coerções" (Elias, 2001: 229) [23].

A Evolução da Sociedade de Corte

No começo de *The Court Society*, Elias considera que a evolução biológica e o desenvolvimento social devem guardar alguma relação, dizendo:

> Certamente existiram alterações biológicas e evolucionárias das interdependências e figurações dos nossos antepassados. Sabemos pouco sobre esse lado da evolução dos hominídeos, provavelmente porque problemas biossociológicos como esses despertaram pouca atenção entre os especialistas na pré-história humana (Elias, 2001: 37).

Elias enfatiza adiante que, "cadeias de acontecimentos aos quais nos referimos conceitualmente sob os nomes de evolução biológica, desenvolvimento social e história constituem três camadas diferentes, mas inseparáveis, de um processo que engloba a humanidade como um todo, e cujo ritmo de modificação é diversificado" (Elias, 2010: 38). No começo de seu livro, Elias identificava que a evolução é um fator em seu trabalho, ainda que nunca o tenha aplicado explicitamente. Estarei aplicando a evolução mais intimamente à *The Court Society* para demonstrar o forte relacionamento existente entre o arcabouço de Elias e a seleção natural, empregando conceitos e sistemas apresentados nas seções anteriores.

O processo de transferência hereditária por meio da genética, como mostrei, é um processo biológico, mas a hereditariedade não está presa à biologia, o processo ocorre de forma transversal aos espectros da existência. Examinando as estruturas residenciais dos cortesãos, seu tamanho e leiaute, a funcionalidade que possuem, são um mapeamento físico literal de sua figuração social. A sociedade de corte, por meio da figuração inter-relacionada de sua realidade, proveu a total possibilidade daquilo que o *hôtel* e Versalhes poderiam ser. O consumo conspícuo e a motivação contínua em prol da busca pelo reconhecimento informaram a completa racionalidade da figuração dos cortesãos, criando a visão de mundo na qual atuaram e existiram.

Desse modo, as construções que habitavam, como demonstrou Elias, refletiram a integralidade de suas identidades. As ciências sociais evolucionárias reconhecem que processos biológicos são apenas uma dimensão de processos multidimensionais. As moradas numa sociedade de corte são literalmente crias da figuração dessa própria sociedade de corte, ocupando, tal como a transferência hereditária permite, os traços fenotípicos de seus genitores. O grande salão para os eventos sociais, a distância em termos de pouca intimidade entre o senhor e a senhora da casa, e a demonstração de riqueza em termos de acessórios e mobiliário eram todas expressões das práticas físicas da sociedade de corte.

Isso não se aplica apenas às residências, mas igualmente aos costumes e à etiqueta, à tradição, ao romantismo e à economia monetária, para citar apenas algo do que foi examinado. Cada uma dessas figurações tem por necessidade um processo de hereditariedade que garanta que sejam adotadas e aprendidas em cada indivíduo que travam com elas contato. Essa é a única maneira pela qual figurações sociais podem sobreviver. Ou seja, o indivíduo (ator, ou "micro-organismo de pensamento") adere a uma figuração social (estrutura, ou "organismo de pensamento") por consequência de seu nascimento, ambiente, etc. que vem a informar a identidade do ator, e, sendo reproduzida por gerações através da hereditariedade, se torna a tradição a qual o novo ator pratica. Entretanto, isso ocorre em quase infinito grau de possibilidades representacionais, dependendo do uso da informação, pelo indivíduo, proveniente dos reservatórios disponíveis e do ambiente interveniente. Os reservatórios de informação, ou cultura, a totalidade do aprendizado compartilhado e individual, contêm todas as possibilidades de figurações sociais adotáveis a partir das quais se constroem identidades e realidades. Os membros da corte sacaram desses reservatórios

disponíveis dadas as suas respectivas figurações, que informaram suas identidades e realidades pela necessidade de suas posições, algo essencial para sua sobrevivência social e física. Não tivesse o nobre da corte a habilidade de se adaptar a ambientes mutantes, então o equilíbrio nos enfrentamentos de poder que existiram no interior da sociedade de corte não teria sido possível e a nobreza teria perecido por completo muito antes da Revolução Francesa. Nossa evolução biológica, como sugeriu Barkow, criou o mecanismo necessário para constantemente nos adaptar a novos ambientes sociais, e nossa evolução social está inerentemente ligada à nossa evolução biológica como resultado da transferência hereditária de princípios sistêmicos. Criticamente, no entanto, na medida em que as figurações se tornam crescentemente complexas e ganham mais conexões (e mais atores), a habilidade de adaptação se torna mais dificultada; mais atores precisam se adaptar por si próprios no âmbito dessas figurações antes que a figuração como um todo possa refletir essa "mutação".

A diferença principal entre a evolução social e a biológica é, como escreve Elias, a variação na velocidade da mudança. O motivo para isso é bastante simples, e está relacionado às necessidades humanas de informação. Informação é a ferramenta mais importante de sobrevivência com que conta *Homo sapiens*, dado que, sem ela, a espécie humana teria desaparecido há muito tempo. Nossa evolução biológica é, sob um ponto de vista das percepções humanas, bastante lenta, tomando de centenas a milhares de anos para produzir alterações muito pequenas, e outras tantas centenas de milhares de anos para mudanças mais substanciais. Isso se deve ao fato de que o ambiente, ao longo da maior parte da existência da vida no planeta, tem sido relativamente estável. O ambiente é um dos mais importantes componentes da evolução, de modo que, se o ambiente influencia espécies estando em relativo equilíbrio, então a evolução continuará biologicamente. Entretanto, com o aparecimento do cérebro humano, e sua adaptabilidade altamente plástica, algo único vem a ocorrer: a habilidade de alterar o ambiente reflexivamente.

A consciência afetada pela reflexão permitiu aprendizado e manipulação do ambiente, e, assim, a criação da cultura. A cultura, como um produto hereditário da evolução, muda o ambiente no qual a espécie humana agora se desenvolve. A informação inegavelmente amplia a capacidade de alterar o ambiente físico em proveito humano, ampliando intensamente, por sua vez, a capacidade de sobrevivência. O volume de informação e a velocidade com a qual pode ser obtido aumentaram exponencial e continuamente desde a emergência do gênero *Homo*. Por meio da cultura, humanos estão continuamente criando identidades e realidades socialmente construídas, adicionando novas dimensões ambientais à existência humana gradualmente. Por meio da reflexão, o aprendizado continuamente se tornou mais refinado pela consciência sob o efeito de estímulos ambientais, desenvolvendo a cultura por meio desses processos.

No âmbito da sociedade de corte, o ambiente continuamente mutável forçava a nobreza e o rei a se adaptarem a novas situações. Tiveram de adaptar suas identidades de modo a permanecer ambientalmente em vantagem em tempos precários. Resistindo, como Elias aponta, teriam essencialmente sido extintos, tal como se deu com os cavaleiros e com o sistema feudal. É nesse ponto em que a condição de inter-relacionamento é essencial. A extinção do sistema feudal ocorreu devido ao fato de que a figuração de inter-relacionamento, o "organismo" conformado pela figuração feudal, não contava mais com atores ("micro-organismos") capazes de reprodução, de adaptação, e de estabilização do todo de conexões no âmbito da figuração. Como um vírus num corpo, existia apenas enquanto cópias continuassem a se replicar; se as cópias fossem varridas, suprimidas ou insuficientes, o vírus não mais funcionaria. O sistema feudal e os cavaleiros sofreram esse mesmo destino, de indivíduos que não mais eram capazes de se adaptar e se reproduzir em compasso com um ambiente que se

tornava inóspito para uma figuração como aquela, de modo que falharam na luta pela sobrevivência.

Figurações sociais, então, são algo como organismos embasados nas leis da natureza, e são do mesmo modo capazes de existirem e serem extintas. Evolução por seleção natural apenas funciona a partir de condições já existentes, e as conexões com que conta uma figuração social podem ser influenciadas e remoldadas, evoluindo em direção a uma nova figuração social dependendo dos reservatórios de informação e do modo pelo qual indivíduos se inter-relacionam. Elias deixou evidente tal ideia por meio da sociogênese da sociedade de corte. O absolutismo é descendente do feudalismo, e a sociedade de corte da sociedade cavalheiresca. A parturiência social é resultado da habilidade do ator individual de manobrar no interior de uma figuração social com a qual está entrelaçado. Isso é possível porque o indivíduo recorre a, e formula suas identidades e realidades a partir de, uma multiplicidade de reservatórios de informação disponíveis em suas respectivas sociedades, criando a possibilidade de modificar seu ambiente mais imediato (nesse caso, a corte). Ao fazê-lo, juntamente com as influências ambientais, pequenas variações de informação são trazidas para dentro da figuração social e acabam por remoldar suas conexões, gerando variações nas práticas (mutação de pensamento) na figuração. Dependendo da interpretação da informação pelo ator individual, de influências tais como o rei, um nobre de alto escalão, ou uma burguesia carismática, e as potencialidades que representam para o enlaçamento, fazem com que a figuração social comece a se modificar, aglutinando as conexões inter-relacionadas em um novo "ponto gravitacional" (tal como na analogia dos filamentos galácticos, tratada anteriormente) à medida que mais conexões são remoldadas e exercem impacto. Por longos períodos de tempo, essa mutação pode eventualmente se tornar forte o suficiente, a informação acumulada ser tal, e as conexões tão plenas a ponto de uma nova figuração (uma nova "espécie") emergir a partir de figuração antiga. Esse processo é exemplificado pelas figurações feudal e cavalheiresca na obra de Elias. É durante esse processo que os conflitos sociais emergem, o que é visto com o nobre tendo de escolher a irrelevância de ser um aristocrata terratenente ou ser um cortesão de base absolutista.

Sendo os humanos uma espécie reflexiva, os conflitos sociais que emergem a partir de figurações sociais concorrentes podem, curiosamente, conduzir à romantização de figurações prévias e então bem-sucedidas [24]. Na evolução, como nada é completamente erradicado, aspectos de informação genética sobrevivem e são levados adiante porque toda a vida compartilha de uma fonte comum que evoluiu pelos últimos 4,1 bilhões de anos [25]. Em outras palavras, a evolução não reconstrói do zero, ela continua a adaptar aquilo que já estava previamente construído. O mesmo vale para a evolução social uma vez que a possibilidade social compartilha de uma origem comum que tem se desenvolvido pelos últimos 1,8 milhões de anos [26]. Os reservatórios de informação a que recorremos e as nossas redes de figurações sociais inter-relacionadas estão ligadas pelos mesmos princípios, de modo que nossa reflexividade é capaz de grande alcance, ainda que enviesado. O Romantismo pode ser entendido como uma mal-adaptação em duas frentes. Na primeira temos aquilo que é chamado de "teoria da incompatibilidade", que afirma que, sendo a evolução biológica lenta, ela está sempre defasada em relação aos ambientes correntes, de modo que o organismo está em contínuo estado de crise evolucionária e constantemente tendo de se adaptar ao presente. Quando as adaptações finalmente se concretizam, novas circunstâncias há muito já substituíram a situação prévia, que afetava a adaptação em primeiro lugar. Isso pode ser atestado na maneira pela qual os seres humanos estão gradualmente nascendo sem os terceiros molares. Útil para bocas maiores e dietas com mais alimentos crus, os sisos são completamente inúteis hoje em dia. Uma vez que nossa evolução social segue os mesmos princípios, noções românticas do passado podem ser categorizadas como teoria da incompatibilidade manifesta por meio

de reflexão consciente porque nossos reservatórios de informação, com informações remanescentes de figurações passadas, serão sem dúvida enviesados em decorrência da conflitos de informação presentes, criando uma imagem mais romântica do que aquilo que realmente foi.

A segunda causa da mal-adaptação romântica poderia ser o resultado do fato de que informações no reservatório são consistentemente caóticas, de modo que indivíduos estão continuamente trabalhando através de conflitos informacionais. Alguma informação nos reservatórios se tornam velhas, irrelevantes, ou são simplesmente erradas, enquanto alguma informação se torna tão bem-sucedida que figurações sociais afetadas por essa informação desenvolvem conexões saudáveis e duradouras [27]. O Romantismo não apenas conflita com reservatórios de informação, criando choques com ambientes correntes, mas também contém informação errada, tal como o enfoque particular que os nobres deram à natureza e à vida livre, deixando de lado aspectos menos desejáveis como o adoecimento crescente e a guerra. O Romantismo foi, de acordo com o estudo de Elias, e de forma bastante visível hoje, um aspecto contínuo da consciência social através de muito daquilo que Elias chamou de "processo civilizador" (2006). A civilização trouxe, sem dúvida, um crescimento exponencial em desenvolvimentos sociais, fazendo com que reservatórios de informação e suas redes nasçam, se adaptem, entrem em conflito, e morram, em ritmos cada vez mais intensos.

A título de síntese, os processos descritos nessa seção seriam aplicados no último capítulo do livro de Elias, que trata da sociogênese da Revolução Francesa. Elias escreve:

> Às vezes tentou-se esclarecer deslocamentos explosivos da distribuição de poder na sociedade, como a Revolução Francesa, exclusivamente a partir dos acontecimentos que antecederam de modo imediato o período revolucionário ou que fizeram parte dele. Mas em geral só é possível compreender tais conflagrações violentas quando prestamos atenção nos deslocamentos do equilíbrio de poder de longa duração que ocorreram na sociedade em questão (Elias, 2001: 267).

Os cortesãos, vivendo nas últimas décadas do século XVIII sob o reinado de Luís XVI tinham se tornado estagnados em decorrência de sua contínua luta pela sobrevivência, e começaram a declinar. A luta pela sobrevivência entre a nobreza estava sendo eclipsada pela burguesia, continuamente bem sucedida. Desde Henrique IV, o nascimento da figuração burguesa cresceu continuamente em poder à medida que sua riqueza, mentalidade liberal e figurações socialmente conscientes se adaptaram e se desenvolveram. A gravidade das conexões nas figurações sociais da sociedade de corte começou lentamente a se alterar, ao passo que a nobreza, mesmo ainda configurando uma classe social elevada, não foi capaz de restaurar com sucesso suas posições de poder em contraposição às posições burguesas crescentemente presentes; desse modo, essas duas figurações entraram em conflito pela sobrevivência.

No tempo do reinado de Luís XVI, o então monitorado equilíbrio havia se tornado autorregulado (Elias, 2006). Como resultado, o rei não era mais necessário para o tanto que mantinha o equilíbrio da rede inter-relacionada da sociedade de corte. A distância do rei não era mais capaz de manipular a sociedade de corte em favor dele, e isso criou frequentes flutuações no equilíbrio de poder. A figuração do rei e da nobreza, tão atada a tradições de etiqueta e cerimônia, se tornava crescentemente desvantajosa em promover adaptação contra o *fitness* da nova figuração burguesa, que estava se equiparando em poder e riqueza mesmo aos dos nobres de maior escalão. As elites e a família real estavam aprisionadas pelos laços de sua

interdependência, incapazes de se adaptar na medida em que o ambiente externo mudava mais rápido do que o compatível com o ritmo de adaptação. O "povo", se encontrando na mesma figuração social do "Terceiro Estado", como a burguesia, se conectou rapidamente à crescente figuração burguesa com promessas de "liberdade, igualdade, fraternidade". Isso drasticamente ampliou a força e o *fitness* da figuração burguesa em desenvolvimento desde Henrique IV. A poderosa figuração burguesa estava começando a sobrepujar a figuração da sociedade de corte – e a deriva social tinha início. Como um anticorpo em um vírus, a figuração burguesa atacou a figuração de corte competidora e então deu início à Revolução Francesa.

Conclusão

Meu desejo é o de que tenha sido capaz de prover uma proposta singular a respeito de como pensar a respeito de figurações sociais usando as leis da natureza estabelecidas pelas ciências naturais. Elias escreve:

> É possível determinar as estruturas de um sistema de dominação como figuração de indivíduos interdependentes, quase com o mesmo rigor de um cientista ao determinar a estrutura de uma molécula especifica (...). Cada campo de dominação apresenta-se como uma rede de homens e grupos humanos interdependentes, agindo em conjunto ou em oposição num sentido bem determinado (Elias, 2001: 133-134).

Ampliando o pensamento de Elias, a molécula é a rede de átomos que se forma tão somente se os átomos são ligáveis. Caso um átomo em particular não seja atraído propriamente a uma molécula em formação, ele será repelido. Os reservatórios de informação que instruem as figurações sociais agem em maneira similar – humanos sacam contra esses reservatórios, produzindo identidades e realidades através de construções sociais, instruindo o modo pelo qual alguém se anexa a redes de inter-relacionamento específicas. É por esse motivo que não se vê um protesto marxista em favor da liberdade de mercado neoliberal; não há forma possível de conexão porque o reservatório de informação particular informa o formato figuracional individual, aquilo com que se ligam, e aquilo que repelem.

Esse estudo introduziu a seleção natural em um nível elementar esperando inspirar estudos futuros nesse campo para uma melhor integração entre trabalhos das ciências sociais e naturais, e igualmente demonstrando a insensatez dos argumentos deterministas e reducionistas – a evolução constantemente adapta e remolda, nada é dado ou determinado. A ciência social evolucionária foi apresentada aqui em formato introdutório de modo a prover um arcabouço através do qual a biologia evolucionária opera, ampliando o entendimento do formato e do fluxo permitido ao social pela evolução. Demonstrou o modo pelo qual cada cultura, cada reservatório de informação, ainda que vindos de uma mesma fonte, se desenvolveram como uma grande árvore com seus ramos evolucionários singulares. *The Court Society*, de Norbert Elias foi aqui examinado através da introdução de componentes chave que iluminam a estrutura das redes figuracionais inter-relacionadas, como quis o autor. Por fim, ao aplicar o arcabouço de Elias aos processos de evolução social por seleção natural, um modelo mais holístico e multidimensional foi proposto. Esse novo modelo provê maior definição para o modo pelo qual as redes de figurações inter-relacionadas de pessoas e ideias evoluem no tempo e agem e funcionam como um organismo vivo, afetado pela vasta gama de estímulos, para além do fato de que, por si, são produtos hereditários de organismos vivos. Esse trabalho não se pretende definitivo, mas se propõe a inspirar investigações sobre a validade das narrativas evolucionárias de processos sócio-históricos, e se um estudo nesses marcos, como apresentado aqui, pode enriquecer nosso entendimento do social como eu

acredito que o faça.

Ao pensar a respeito do formato das redes na maneira que o fazemos, em conjunto com a manobrabilidade que um indivíduo traz a ela através da reflexão consciente, se pode compreender a complexidade do modelo que Elias sugeria, e que aqui levei adiante. O campo se torna uma rede multidimensional que o macro-historiador ou o sociólogo histórico podem estudar, considerando a rede interconectada que é formada pelos fenômenos sociais. Mesmo que sociólogos ainda resistam à aplicação de processos evolucionários biológicos, creio que tal aplicação fica clara pelo exemplo de *The Court Society*, de Elias, sobre como a evolução pode enriquecer a pesquisa em ciências sociais e nas Humanidades. Ao abrir as ciências sociais aos processos da natureza, novo entendimento da condição de inter-relacionamento emerge. Uma conexão não apenas no sentido da escala mais ampla do Cosmos, mas uma conexão mais íntima com as realidades e experiências que nós, seres humanos, compartilhamos com o mundo natural.

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Notas finais

1 Darwin foi estimulado a publicar por uma carta recebida de Alfred R. Wallace (1823-1913) que incluía a uma teoria muito simular à de Darwin.

2 O fundador da sociobiologia.

3 Emprego a noção de espaço-tempo de uma forma aplicada ao social. Como sua contraparte nas ciências naturais, é usada para identificar a maneira pela qual ocorrências no tempo e no espaço não são nem estáticas nem entidades separadas. Eventos que ocorrem no âmbito da experiência humana apresentam efeitos vitais ondulares que persistem por gerações nas identidades, instituições, etc. Espaço-tempo define um movimento da história social mais fluido e dinâmico através da experiência humana.

4 Um processo natural, que explica a similaridade entre um filho e seus pais. Isso levou a um conceito inicial de gene que antecedeu o entendimento corrente na genética, que foi originalmente introduzido por Gregor Mendel (1822-1884).

5 Uma afirmação ao trabalho de Darwin e Wallace, muito do que compõe sua elaboração mais central estava correto e segue sendo usado na biologia moderna.

6 Dos quais 98,8% são compartilhados com o chimpanzé-comum, 88% com o rato comum, e 24% com a uva de vinho. Isso foi descoberto a partir do trabalho revolucionário do Programa Genoma Humano que não apenas sequenciou o código genético humano mas pavimentou o caminho para o sequenciamento de milhares de espécies vivas, as ferramentas que, no futuro, permitirão modificações genéticas em um nível sem precedentes.

7 As proteínas timina, guanina, adenina e citosina. Juntas criam o código alfabético de sequências genéticas que compõem todas as coisas vivas.

8 Um processo necessário para o desenvolvimento de qualquer espécie dado o fenótipo. Um exemplo estaria no embrião humano que nasce com uma cauda, que desaparece conforme o desenvolvimento prossegue intrauterinamente, ou o formato das mãos humanas, ainda que todos os mamíferos tenham mãos mais ou menos do mesmo formato em condição embrionária.

9 Uso a expressão "descoberta" aqui porque seu trabalho sobre seleção natural e transmissão hereditária é fundacional para a biologia evolucionária moderna, que é fato científico.

10 Para a reprodução, ADN é copiado pelo ARN com o propósito de fertilização e impregnação.

11 Emprego o termo integração compatível porque vejo o uso da palavra "vertical" como tendo excessiva implicação em termos de algum tipo de ordem hierárquica. De todo modo, "compatível" é mais aplicável àquilo que Barkow delineia como uma compatibilidade interdisciplinar compartilhada.

12 Uma monarquia absolutista é descrita pelo controle do governante sobre a integralidade das operações do Estado, como o âmbito judicial, administrativo, e de assuntos estrangeiros ou do interior, sob a bênção do direito divino, ou da vontade de Deus.

13 O artigo original, em inglês, cita edição em língua inglesa de 2005. As transcrições serão feitas, nessa versão em português do artigo, empregando edição brasileira de *A Sociedade de Corte*, publicada em 2001 pela editora Zahar, como consta da bibliografia (Nota do Tradutor).

14 A melhor analogia para pensar sobre isso seria imaginar os filamentos galácticos do Cosmos como a mais ampla escala conhecida. Eles existem em três dimensões, e da mesma forma ocorre com as figurações sociais sendo propostas aqui. A concentração de gravidade nos filamentos galácticos seria onde o mais intenso amontoamento de pontos singulares (atores) convergem na figuração.

15 A família, ou casa, como é por vezes chamada,

é decisiva na compreensão da nobreza. Antes de o rei Henrique IV iniciar a venda de papeis administrativos para a cada vez mais rica burguesa, a linhagem familiar era o mais importante componente do *status* de nobreza. Velhas famílias com relações de proximidade com a família real estariam em uma posição de muito maior poder do que aquela em que estariam a nobreza recente ou a nobreza da terra. A manutenção da posição familiar e da influência pessoal de um indivíduo se torna a função mais crítica da sociedade de corte.

16 A casa, usada dessa forma, identifica a importância de um nome familiar e sua significância genealógica.

17 E, também, sua dependência em relação ao "povo", e vice-versa. Serviçais, por exemplo, eram importantes para a operação e a estabilidade de famílias nobres e da família real.

18 Elias emprega "figuração" ao invés de "sistema", algo que com que fortemente concordo, porque sistema identifica uma relação mais rígida e estruturada, que aponta para uma organização mais manufaturada de processos. Figuração é mais aberto, mais fluido e mais maleável.

19 A "racionalidade" da corte que existiu para os nobres cortesãos poderia não ser entendida por qualquer um fora daquela rede, da mesma forma que a "racionalidade" do "povo comum" não poderia ser entendida pelos nobres. Isso se tornou particularmente claro durante a Revolução Industrial francesa, quando capitalistas acreditavam que as classes trabalhadoras perdiam todo seu dinheiro em bebida e pequenos desperdícios, enquanto essas mesmas classes acreditavam que os capitalistas estavam entregues aos gastos extravagantes e fora de controle. Essa dinâmica é evidente, ainda que em favor dos trabalhadores, na novela de época, *Germinal*, de Émile Zola.

20 Isso funciona de forma idêntica à honra e ao orgulho do nobre, mas com consequências muito mais amplas.

21 Armadura e espada, por si só, eram extremamente dispendiosas.

22 Deve-se lembrar que seu trabalho foi produzido antes do movimento ambientalista dos anos 1970.

23 É importante notar que Elias afirma que essa romantização apenas projeta aspectos do passado que parecem positivos, dado que sociedades particulares apresentam desejos e ignoram quaisquer de suas menos desejáveis características. Isso é um testamento para o arcabouço desenvolvido por Elias, uma vez que é claramente observável hoje e tem o sido desde os anos 1970 com o ambientalismo e a romantização do "bom selvagem".

24 Essa pode ser a fonte de um interessante projeto de pesquisa, que empregue o modelo figuracional para identificar se o Romantismo representa um processo de mudança figuracional tal como o apresentado aqui.

25 A data corrente é 22 de outubro de 2015.

26 Essa data é significativa por dois motivos. O primeiro, porque se acredita que é a partir daí que o gênero *Homo* começou a aumentar sua população a taxas crescentes. O segundo, porque, devido ao crescimento demográfico, começaram a deixar a África e se dividir grupos nunca antes estabelecidos.

27 Richard Dawkins acredita ter sido essa a obra da religião.

A Theory of No-Thing

André de Vinck

Abstract
How can we define a new general theory of evolution and, consequently, a new general theory of evolutionary history? First, we have to solve the mystery that lies at the heart of Darwin's great book. Second, we have to trace the beginnings of nature-culture-history. Darwin couldn't define the term species and his successors can't define the term gene. A standard solution to this dilemma is to define a species as a group of dimorphic organisms that successfully exchange genes. However, one undefinable thing can't be used to define another undefinable thing. Instead of tracing the evolution of undefinable things, we can trace the evolution of definable relations–e.g. exchange. To exchange means to put in relation and, therefore, to signify the relative values of the signifiers being exchanged as well as the relative values of the signifiers initiating the exchange. In this context I s uggest that nature begins with the dynamic of exchange, culture begins with the practice of exchange, history begins with the syntax of exchange. Instead of a theory of every-thing, therefore, I propose a theory of no-thing. I propose that no-thing exists in and of itself and that every-thing evolves as a co-incidental eco-matrix of the signifying relations of exchange.

Key Words
evolutionary history, exchange theory, complexity, reflexivity, theory of nothing, theory of no-thing, theory of everything, origin of culture.

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How can we define a new general theory of evolution and, consequently, a new general theory of evolutionary history? First, we have to solve the mystery that lies at the heart of Darwin's great book. Second, we have to trace the beginnings of nature-culture-history.

In the "Introduction" to *On the Origin of Species* (1859), Darwin summarizes his Malthusian theory of evolution: "As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be *naturally selected*. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form" (*OS*, 6). In this way Darwin answers the question posed by his title: The origin of species can be traced to the evolutionary dynamic of multiplication and variation, selection and adaptation. He fills in the details of that dynamic in the rest of his great book. Case closed.

And yet, not so fast. In fact, the case remains open because the mystery that lies at the heart of Darwin's great book remains unsolved. We can begin again with the question posed by Darwin's title: What is the origin of species? When Darwin tries to define his basic terms, he acknowledges that, "Certainly no clear line of demarcation has yet been drawn between

a species and a sub-species...or again between a sub-species and well-marked varieties, or between lesser varieties and individual differences" (*OS*, 44). And then he admits that, "I look at the term species, as one arbitrarily given for the sake of convenience to a set of individuals closely resembling each other, and that it does not essentially differ from the term variety, which is given to less distinct and more fluctuating forms. The term variety, again, in comparison with mere individual differences, is also applied arbitrarily, and for mere convenience sake" (*OS*, 45). In other words, Darwin admits that he can't distinguish a species from a sub-species, a sub-species from a variety, a variety from a difference. He admits that what he and his fellow naturalists define as the essential identity of a species is in fact nothing more than a convenient collection of the formal similarities of an arbitrary group of apparent differences. He admits that a species is undefinable. In short, in the second chapter of his great book, Darwin confronts the radical implications of his radical theory of evolution: i.e. the origin has no originality and the species has no specificity. And so Darwin's title, *On the Origin of Species*, along with the question posed by it, is fantastically ironic. And here we confront the mystery that lies at the heart of his great book: If it isn't the species that is evolving, then what exactly is evolving?

Darwin was primarily an empirical field biologist, an empirical laboratory researcher, an empirical natural historian. He was only secondarily, and quite hesitantly, an evolutionary theorist. And no wonder he hesitated–given the religious authority of biblical history in mid 19th century England and Europe. He finally presented and published his Malthusian theory of evolution only after Wallace sent him an outline of his own, independently articulated, version of it. Even so, Darwin continued to struggle with the radical implications of his radical theory throughout his great book. He recognizes, for example, that the temporal flow of evolutionary history undermines the spatial table of natural history as well as the vertical ladder of metaphysical history. Specifically, he recognizes that if the never-ending temporal flow of apparent differences admit "no clear line of demarcation," then he and his fellow naturalists have to abandon Linnaeus' spatial table of formal similarities and Lamarck's vertical ladder of essential identities. However, instead of pursuing the radical implications of his radical theory, Darwin immediately retreats from them. He tries to jam his temporal theory of evolutionary history back into Linnaeus' spatial theory of natural history. And, as we shall see, he ultimately tries to hoist his evolutionary history of apparent differences and Linnaeus' natural history of formal similarities back up the ladder of Lamarck's metaphysical history of essential identities. And he huffs and puffs with all kinds of qualifications and rationalizations as he struggles to achieve that goal.

Immediately after admitting that he can't draw the lines which demarcate a difference, a variety, a sub-species, a species, Darwin returns to the task of drawing those lines. That is, he returns to the task of drawing up the spatial tables of natural history: "I thought that some interesting results might be obtained in regard to the nature and relations of the species which vary most, by tabulating all the varieties in several well-worked floras" (*OS*, 45). Although he recognizes some of the difficulties involved in drawing up these new spatial tables in the context of his new temporal theory, he announces that, "I shall reserve for my future work the discussion of these difficulties..." (*OS*, 45). In other words, Darwin puts off the question of time for another time because he doesn't have time to address it–and because he doesn't know how to address it. He releases the temporal genie of evolutionary history from the spatial constraints of natural history and then he tries to put that genie back into the bottle–or, in this case, back into the Linnaean box. And so, not surprisingly, the general conclusions he draws from his new natural-historical tables are fraught with evolutionary-historical equivocations. He states, "Hence it is...the dominant species...which most oftenest produce well-marked varieties, or as I consider them, incipient species" (*OS*, 46). He recalls,

"We have seen that there is no infallible criterion by which to distinguish species and well-marked varieties..." (*OS*, 48). And so he struggles with the contradictions of the spatial framework that he tries to re-impose on his temporal narrative.

In this context Darwin turns to the rationalizations of analogy and averages. He explains that when he and his fellow naturalists consider two related varieties, they "...are compelled to come to a determination by the amount of difference between them, judging by analogy whether or not the amount suffices to raise one or both to the rank of species" (*OS*, 48). And he agrees with his colleagues who suggest that "...in regard to plants...and insects...the difference between species is exceedingly small." He continues, "I have endeavoured to test this numerically by averages..." (*OS*, 48). And yet again he acknowledges that, "Finally, then, varieties have the same general characters as species, for they cannot be distinguished from species..." (*OS*, 49). While the temporal streams of a Darwinian evolutionary history of apparent difference cannot be contained within the spatial grids of a Linnaean natural history of formal similarity, or, for that matter, sustained by the vertical steps of a Lamarckian metaphysical history of essential identity, nevertheless Darwin keeps returning to Linnaeus' grids and, ultimately, Lamarck's steps. And, again, Darwin is primarily an empirical field biologist, an empirical laboratory researcher, an empirical natural historian. Whenever he confronts the radical thought of the non-identity of non-identity, he quickly retreats to his empirical presuppositions. And we can only admire the way in which he struggles to give birth to his radical Neo-Socratic rhetorical theory of evolutionary history in the context of Linnaeus' moderate Neo-Aristotelean grammatical theory of natural history and Lamarck's conservative Neo-Platonic logical theory of metaphysical history.

At the end of his great book Darwin once again returns to the Neo-Socratic rhetoric of the non-identity of non-identity–i.e. to the temporal streams of the fluctuating appearances of difference. He concludes, "In short, we shall have to treat species in the same manner as those naturalists treat genera, who admit that genera are merely artificial combinations made for convenience. This may not be a cheering prospect; but we at least will be freed from the vain search for the undiscovered and undiscoverable essence of the term species" (*OS*, 392). Darwin admits, once again, that there is no such thing as a distinctly identifiable species that can be clearly demarcated. And yet he doesn't take the next step. He doesn't admit that since he can't define a species, then he can't discover the origin of species. Instead, at the end of his great book, he invokes a radical Neo-Socratic rhetoric of the exigency of appearance–e.g. "...but at least we will be freed from the vain search for the undiscovered and undiscoverable essence of the term species" (*OS*, 392); a moderate Neo-Aristotelian grammar of the teleology of form–e.g. "And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress toward perfection" (*OS*, 395); and a conservative Neo-Platonic logic of the ontology of essence–e.g. "Therefore I should infer from analogy that probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was breathed by the Creator" (*OS*, 391). In fact, recent genetic research does suggest that all living animals did evolve from a common ancestor that existed about 650 million years ago. Paps and Holland "...using extensive genome comparisons...infer the minimal protein-coding genome of the first animal..." (*NC*, 04/30/18). In a remarkable feat of devolutionary genetics, they infer the identity of 6,331 genes in that primeval genome. However, it requires a leap of faith, a great chain of being, or a ladder of metaphysics to get from that primeval genome to what Darwin calls the breath of the Creator.

Derrida would say that the structural logic of Darwin's metaphysical history and the phenomenal rhetoric of Darwin's evolutionary history deconstruct one another. According to Derrida, every text is a battle of wits between the King of Logic and the Jester of

Rhetoric, between the tragedy of Lear and the comedy of the Fool, between the structure of meaning and the phenomena of interpretation. As a result, every text tumbles into the postmodern abyss of signification. And yet we should note that it is Derrida himself who opens up that postmodern abyss when he brackets and elides the functional grammar of the narrative. It is Derrida himself who breaks the grammatical link between logic and rhetoric. Why does he break that link? He does so in order to reveal how the ploy of logic constructs the hierarchies of meaning in the text and how the play of rhetoric undermines the hierarchies of interpretation in the mind. However, Derrida pays a high price for his deconstructive phenomenological revelations. He throws every text into the postmodern abyss of signification that can't be bridged by the narratives of history.

Instead of deconstructing the binary opposition of Darwin's structural logic and his phenomenal rhetoric, therefore, I want to rehistoricize the trinary economy of Darwin's structural logic, functional grammar, phenomenal rhetoric. I want to suggest that when Darwin confronts the phenomenal rhetoric of apparent difference–i.e. the non-originality of origin, the non-specificity of species, the non-essentiality of essence–he retreats from that phenomenal rhetoric by writing a new version of Linnaeus' functional grammar of formal similarity and a new version of Lamarck's structural logic of essential identity. In edition after edition of his great book, Darwin struggles to reconcile his version of his temporal evolutionary history with his version of Linnaeus' spatial natural history and his version of Lamarck's hierarchical metaphysical history. However, his attempt to reconcile the rhetoric-grammar-logic of his evolutionary narrative fails. As a result, the mystery that lies at the heart of his great book remains unsolved: If it isn't the species that is evolving, then what exactly is evolving?

Darwin knew there was an underlying logic to the evolutionary process of descent with modification, but he admits that, "...the laws governing inheritance are quite unknown..." (*OS*, 13). And so he falls back on generic euphemisms. He refers to "the strong principle of inheritance" (*OS*, 6). He wonders, "Whatever the cause may be of each slight difference in the off-spring..." (*OS*, 139). And he cites, "The complex and little known laws governing variation..." (*OS*, 381). Of course, Darwin knew nothing about genetics. Mendel started to breed his pea plants in 1854, but he didn't publish his results until 1866–seven years after Darwin published his great book. An uncut copy of Mendel's obscure journal article was found in Darwin's library (Henig, *MG*, 143). Presumably, Mendel had sent him a copy and, evidently, Darwin never read it. Instead of focusing on the genetic logic of modification as articulated in multiple generations of pea plants, Darwin begins his discussion of evolution with the generic laws of modification as articulated in multiple generations of pigeons. Mendel bred pea plants, Darwin bred pigeons. And while Darwin didn't even understand how the generic laws of modification worked–he thought offspring more or less averaged the traits of their parents–he did recognize that he and his fellow pigeon breeders could manipulate the logical laws of modification via the grammatical rules of selection. That is, he and his fellow breeders selected and mated birds with the traits they wanted and, in this way, they further domesticated the natural logic of modification, the natural grammar of selection, the natural rhetoric of adaptation. And yet Darwin still couldn't distinguish a set of differences from a variety, a variety from a sub-species, a sub-species from a species.

In fact, the entire argument of Darwin's ironically titled book, *On the Origin of Species*, proves that there is no such thing as the origin of species. There is no such thing as a distinction, a variety, a species with an origin-essence-identity. The often elided preposition that begins Darwin's title reminds us that Darwin does not actually discover the origin of species, rather he describes an evolutionary dynamic that undermines the very idea of an original origin, a specified species, an essential essence. And so he struggles to work out a new evolutionary-historical economy of the logic-

grammar-rhetoric of the modification-selection-adaptation of distinctions-varieties-species. And, again, he does not succeed. In one paragraph he advances his radical evolutionary history, in the next paragraph he returns to Linnaeus' moderate natural history. And, in the end, he even returns to Lamarck's conservative metaphysical history. While Darwin doesn't pursue the radical implications of his radical theory, we are pursuing them. If it isn't the essential identity of a species that is being modified-selected-adapted over and again down the ages, then what, exactly, is evolving?

The rediscovery of Mendel's work at the turn of the 20th century and the genetic revolution that followed seemed to solve the mystery that lies at the heart of Darwin and Wallace's theory. Mendel discovered the genetic logic–i.e. the mathematic ratios–of specific traits passed down from one generation of pea plants to another. And that genetic logic seemed to be the missing logic–the missing principle, cause, law–of variation that Darwin did not understand. And therefore, we might conclude, it is precisely the gene–the quintessential unit of evolution–that is being modified-selected-adapted down the ages. However, a funny thing happened on the way to the genetics lab. Just as Darwin realized that he couldn't define a species, so too several leading geneticists have realized that they can't define a gene. What, exactly, is a gene? Should it be defined in terms of its structural configuration, its functional operation, its phenomenal articulation? Should it be defined in terms of its chromosomal location, its cellular manifestation, its somatic generation? What parts of DNA are parts of genes, what parts of DNA are not parts of genes? Just as Darwin ultimately abandons the search for "... the undiscoverable essence of the term species" (*OS*, 392), so too several leading geneticists now agree "... there is no longer a precise definition of what could count as a gene" (Rheinberger et al., *SEP*, 2015). In short, the more closely we examine the boundary of identity, the more quickly it diffuses into a cloud of difference. Of course, just as Darwin fell back on the fuzzy logic of analogy and averages in order to develop an approximate science of the modification-selection-adaptation of species, so too we can fall back on that same fuzzy logic in order to develop an approximate science of the modification-selection-adaptation of genes. However, that stopgap measure still does not solve the mystery that lies at the heart of Darwin-Wallace-Mendel's theory: What, exactly, is evolving? What, exactly, is being modified-selected-adapted?

In contrast to Darwin's nervous critique of the essential identity of a species, Klein opens *The Human Career* (2009)–his comprehensive textbook survey of recent advances in evolutionary anthropology–with the confident assertion that, "The species is the least arbitrary and the most fundamental evolutionary unit, and it must be understood before any consideration of evolution, even one focused tightly on a single species like *Homo sapiens*" (*HC*, 1). Why was Darwin so nervously critical of the idea of the essential identity of a species and why is Klein so confidently certain of it? Precisely because Darwin knew nothing about genetics and Klein knows a lot about it. Klein explains that, "...no matter how detailed the resemblances between two groups of organisms, if individuals cannot exchange genes between groups, the two populations must be assigned to different species" (*HC*, 1). In other words, a species can be defined as a fertile group of dimorphic organisms that successfully exchange genes. And most evolutionary biologists and most evolutionary anthropologists would acknowledge the pragmatic efficacy of that working definition. However, if a species is undefinable and if a gene is undefinable, then one undefinable thing can't be used to define another undefinable thing. In other words, as the Hindu myth suggests, if the flat earth rests on the back of an elephant and if that elephant stands on the back of a turtle and if that turtle stands on the back of another turtle, then it's turtles all the way down. In this context we can take Darwin-Wallace-Mendel's theory of evolution another step forward by solving the mystery that lies at the heart of their argument.

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Instead of tracing the evolution of undefinable things–e.g. species, varieties, genes–we can trace the evolution of definable relations–e.g. exchange. To exchange means to put in relation and, therefore, to signify the relative values of the signifiers being exchanged as well as the relative values of the signifiers initiating the exchange. The relative value of value can be understood as the range of the more optimal and the less optimal ecological articulations of the signifying relations of exchange. In this context I suggest that nature begins with the dynamic of exchange, culture begins with the practice of exchange, history begins with the syntax of exchange. Specifically, I suggest that the signifying relations of exchange evolve the evolutionary algorithms of exchange which evolve the eco-matrices of exchange which evolve, for example, our so called species. In turn, we objectify the co-incidental micro-median-macro eco-matrices of exchange and we call them strings-membranes-quarks; we call them atoms-molecules-cells; we call them genes-varieties-species; we call them life-mind-language; we call them nature-culture-history. Instead of searching for the mythical origin of nature-culture-history, therefore, I suggest that we can trace the long evolutionary history of the signifying relations of exchange. And so, to be clear, in this study I am not talking about all the many, varied signifying relations of this universe, rather I am talking about one particular kind of signifying relation: i.e. exchange.

Of course, as a result of the linguistic turn of 20th century cultural theory, the signifying relations of exchange–as signifying relations–have inspired a vast literature that cuts across the disciplines. I will review and critique a select portion of that literature in the future, but, in the meanwhile, I will cite three key examples in order to clarify and distinguish my theory. In *The Elementary Structures of Kinship* (1949), Lévi-Strauss outlines a universal structural-logical system of exchange that he projects into the unconscious cybernetic mind. In *The Order of Things* (1966), Foucault outlines a general functional-grammatical system of exchange that he projects into the preconscious taxonomic mind. In *Given Time: I. Counterfeit Money* (1991), Derrida outlines a particular phenomenal-rhetorical system of exchange that he projects into the conscious linguistic mind. In other words, just as Lamarck, Linnaeus, Darwin fetishize, respectively, the logic, grammar, rhetoric of the narratives of natural history, so too Lévi-Strauss, Foucault, Derrida fetishize, respectively, the logic, grammar, rhetoric of the narratives of cultural history. As a result, both the modern natural historians and the modern cultural historians fail to put the evolutionary-historical narratives of nature-culture-history back together again. Lévi-Strauss reduces what he defines as the surface rhetorical level of phenomenal history to what he defines as the deep logical level of structural psychology; Foucault reduces what he defines as the surface rhetorical level of phenomenal history to what he defines as the median grammatical level of functional epistemology; Derrida reduces what he defines as the surface rhetorical level of phenomenal history and the deep logical level of structural psychology to a binary opposition that deconstructs itself. In this way Lévi-Strauss, Foucault, Derrida reduce the evolutionary-historical narratives of cultural history to, respectively, a spatialized, ahistorical, structural-logical system of exchange, functional-grammatical system of exchange, phenomenal-rhetorical system of exchange.

In this context I suggest that we can make three moves that will enable us to put the evolutionary-historical narratives of nature-culture-history back together again: 1.) We can decenter language by recognizing that while it is an exquisitely expressive mode of exchange, while it is the medium of thought, speech, writing, while it is the medium of this very sentence, nevertheless language is just one more articulation of the long evolutionary history of the signifying relations of exchange. 2.) We can shift the focus of cultural theory from the 20th century linguistic turn to a 21st century evolutionary-historical reflexivity. 3.) We can

write a reflexive, critical, postmillennial theory of the long evolutionary history of the signifying relations of exchange. That is, while we define and filter our knowledge of the world in and through language and its categories, nevertheless we can decenter language and its categories in a broader evolutionary-historical context. Instead of universalizing the semiotics of language, we can generalize the semiotics of nature-culture-history. Instead of refetishizing spatialized, ahistorical, structural-logical systems, functional-grammatical systems, or phenomenal-rhetorical systems of exchange, we can write reflexive, critical, postmillennial, evolutionary-historical narratives of the signifying relations of exchange. That is, we can re-integrate the logic-grammar-rhetoric of exchange in the evolutionary-historical narratives of evolutionary history.

In short, I suggest that we can advance Darwin, Wallace, Mendel's theories of nature by shifting our attention from the empirical identifications of species, varieties, genes to the evolutionary articulations of the signifying relations of exchange. We can advance Lévi-Strauss, Foucault, Derrida's theories of culture by shifting our attention from the spatialized frameworks of the logical, grammatical, rhetorical systems of exchange to the evolutionary histories of the signifying relations of exchange. We can advance Hegel, Marx, Nietzsche's theories of history by shifting our attention from the mechanical dialectic of mind, matter, morality to the evolutionary algorithms of the signifying relations of exchange. In turn, I suggest we can advance the current theories of complexity by shifting our attention from the phenomenal-structural emergence of complexity to the evolutionary-historical evolution of reflexivity. We will come back to these theories of nature-culture-history and reflexivity throughout the course of this study.

Instead of a theory of every-thing, therefore, I propose a theory of no-thing. Specifically, I suggest that the signifying relations of exchange looped back on themselves over and again down the ages and evolved the evolutionary algorithms of exchange which, in turn, looped back on themselves over and again down the ages and evolved the eco-matrices of exchange which, in turn, looped back on themselves over and again down the ages and evolved, for example, our so called species. In turn, we objectify the co-incidental micro-median-macro eco-matrices of exchange and we call them nature-culture-history. And in this context a new general theory of evolution leads to a new general theory of evolutionary history. The exchange of genes, the exchange of goods, the exchange of greetings, for example, are already very late articulations of nature-culture-history. And so instead of reducing the universe to a static formal table of empirical objectified things, we can recognize the universe as a co-incidental eco-matrix–or, rather, as a vast interactive network of co-incidental micro-median-macro eco-matrices–of the signifying relations of exchange. And with this very argument the long evolutionary history of these co-incidental eco-matrices loops back on itself in and through our so called species and evolves the reflexive consciousness of evolutionary history.

In this context I suggest that every so called thing that evolves from the long evolutionary history of the signifying relations of exchange is, well, relative. That is, no-thing exists in and of itself. And no-thing exists in and of itself because no-thing has a pure origin, pure essence, pure identity. And no-thing has a pure origin, pure essence, pure identity because every-thing evolves from the particular energetic-material and material-energetic, temporal-spatial and spatial-temporal intersections-pathways-networks of the signifying relations of exchange. We can define a so called tree as an object or a thing, for example, only if we completely ignore the fact that what we attempt to fix and to name as a so called tree is actually the evolutionary-historical co-incidence of countless signifying relations of earth, air, fire, water interacting in a particular eco-historical time and eco-geographic place. And we can define a so called tree as an object or a thing only if we completely ignore the fact that the very word "tree" is actually the evolutionary-historical co-incidence of countless signifying relations of

sounds, pauses, letters, signs interacting in a particular socio-historical time and socio-linguistic place. And we can define a so called tree as an object or a thing only if we completely ignore the fact that what we call the consciousness, perception, identity, perspective of what we call the subject who views what we call the object of the so called tree are also the evolutionary-historical co-incidences of countless signifying relations of signifiers interacting in a particular cultural-historical time and cultural-cognitive place. And we can define a so called tree as an object or a thing only if we completely ignore the fact that we are exchanging signifiers from here to here and from now to now along the temporal-spatial and spatial-temporal syntactic pathway of this particular sentence which also happens to link the here-there-everywhere as well as the past-present-future of the places and times where and when this sentence is being written and the places and times where and when it will be read. And so, like Whitman addressing the future generations, "Crossing Brooklyn Ferry," I am addressing the future generations crossing the syntactic ferry of this very sentence. Greetings fellow travelers! We are the time beings! In the time being, the time being now, the time being lives and dies: giving and taking, losing and keeping–a syntax unfolding the narratives of time. In other words, Heidegger got it all wrong: it isn't being and time, rather it's the time being. And as the time being we can study the time being in the hermeneutical mirror of evolutionary history.

A postmillennial painting of a so called tree standing alone in a meadow, therefore, might be a neo-pointillist abstraction which reminds us of the countless energetic-material and temporal-spatial co-incidental interactions of the countless signifying relations of exchange evolving the countless relative-complex-reflexive levels-dimensions-scales and velocities of physics-chemistry-biology, economics-sociology-history, anthropology-psychology-art history, etc., etc. And the painting might also be a blank canvas–because we might have missed the co-incidental bus, because we might have missed the co-incidental articulations of the energetic-material and temporal-spatial eco-matrix of the signifying relations of exchange which define what we retrospectively nominate as the so called universe, nature, tree; self, consciousness, perception; subject, verb, object; sentence, word, signifier; dot, dot, dot and dot and then no-thing but white space.... That is, the painter might be standing in an empty meadow where a magnificent oak tree once stood and where a magnificent oak tree will one day stand. And so the painter might be standing in the blank white space of the present where the energetic-material and temporal-spatial co-incidental eco-matrices of the signifying relations of exchange that evolve what we call a magnificent oak tree no-longer-and-not-yet exists. In this context we can explore the radical evolutionary-historical implications of the radical evolutionary-historical thought of the origin which has no originality, the species which has no specificity, the essence which has no essentiality. We can explore the radical evolutionary-historical implications of the no-thing-ness of no-thing-ness.

And so it should be clear that the evolutionary history of the no-thing-ness of no-thing-ness is not the same so called thing as the existential phenomenology of nothingness, because, as King Lear says in response to the Fool, "Nothing comes from nothing!" Instead, the evolutionary history of the no-thing-ness of no-thing-ness is the evolutionary history of the co-incidental signifying relations of exchange, evolutionary algorithms of exchange, eco-matrices of exchange. In this way we are shifting the attention of enlightened science from the spatialized grids of empirical things to the evolutionary histories of signifying relations. Of course, no matter how many times we make the distinction between the no-thing-ness of no-thing-ness and the nothingness of nothingness, this argument will be, undoubtedly, re-interpreted in some quarters as yet another version of postmodern existential phenomenology. And yet in contrast to the Heideggerian phenomenology of the emergence of being–and in contrast to all the other natural scientific, social scientific, humanistic theories of the essential

structural logic, formal functional grammar, apparent phenomenal rhetoric of the so called universe–I am proposing an evolutionary-historical theory of the astonishingly intricate signifying relations of exchange that connect every-thing as no-thing. And since this postmillennial theory reveals how every-thing is no-thing, then it reveals how every-thing is intricately connected to every-thing else in the co-incidental local-global-universal micro-median-macro eco-matrices of the signifying relations of exchange. Instead of outlining a reductive, economic, neoclassical theory of the systemic rational logic of signification or a reductive, textual, postmodern theory of the endless ahistorical deconstruction of signification, I am outlining a reflexive, critical, postmillennial theory of the long evolutionary history of the signifying relations of exchange.

As a result, we are pushing right up against the very limits of the analytically inclined Anglo-Saxon language. And so we might recall that there are other languages which enable other cultures to understand and represent themselves and the so called universe in different ways. The Navaho language, for example, articulates all kinds of nominative distinctions which make sense of the world and yet the Navaho sentence is dominated by the verb phrase. In *The Navajo Language* (1942), Young and Morgan explain, "The Navajo verb, unlike the English, often contains within its structure not only the verbal idea, but also the subject and object pronouns, and many adverbial modifiers. It is, in itself, a complete sentence" (*NL*, 41). In fact, even many so called Navaho nouns are rooted in verb phrases. In *A Vocabulary of Colloquial Navajo* (1951), Young and Morgan explain that the Navaho word for brother or sister, for example, means literally, "I came out with him/her" (*VCN*, 37). The Navaho word for father's clan means literally, "I am one born for it," while the Navaho word for mother's clan means literally, "I am one born to it" (*VCN*, 98). As Young and Morgan note, "Members of a clan consider themselves to be related as members of an extended family...although in the white man's way of reckoning they are wholly unrelated" (*VCN*, 255). Furthermore, the clan name of a person not only evokes her or his relations with an extended family, but also with an extended ecology: e.g. "the water-flows-together people," "the line-of-willows-extended-out-gray people," "the two-rocks-sit people," etc. (*VCN*, 443-45).

Unfortunately, Young and Morgan reduce the synthetic fluidity of Navaho grammar and vocabulary to the analytic rigidity of Anglo-Saxon grammar and vocabulary–except when they occasionally offer what they call, somewhat condescendingly, literal translations. They insist on citing and translating the infinitive form of the Navaho verb phrase, for example, when clearly the participial form would be so much more evocatively accurate. While they recognize how difficult it is to translate one cultural sensibility into another cultural sensibility, nevertheless the analytic framework of their Anglo-Saxon textbooks offers only a few glimpses of the Navaho's synthetic sensibility. Similarly, the Anglo-Saxon translations of Navaho narratives impose the same analytic grid of subject-verb-object on the synthetic flow of the verb phrase–thus all but annihilating the distinctive Navaho sensibility of the interconnected, interrelational, interdynamic cosmos. In other words, the good intentions of the ethnographers, grammarians, translators sometimes leads to the sad results of cultural appropriation. Hopefully, new synthetic ethnographies, grammars, translations–written by the Navaho people themselves–can offer new ways to evoke the Navaho's synthetic sensibility. The point being that the Navaho language enables the Navaho people to evoke the interconnections of the signifying relations of exchange in ways that are not entirely available in the English language.

The Navaho language helps us recognize, for example, that instead of being bedazzled by the so called miracle of the exact numeric ratios of the exact exchange relations of energy and matter, time and space of this particular universe which were necessary for the very possibility of the evolution of life on earth, in fact the evolution of life on earth articulates the exact numeric ratios of the exact exchange relations of energy and matter, time and space of this particular

universe. That is, the particular signifying relations of exchange which evolved the particular evolutionary algorithms of exchange which evolved the particular eco-matrices of exchange which evolved the particular metabolic articulations of exchange–or what we call life–are part and parcel of the long evolutionary history of the signifying relations of exchange that evolved, and that continue to evolve, this particular universe. In turn, our particular so called species is yet another evolutionary-historical articulation of these same signifying relations of exchange–which are becoming reflexively conscious of themselves in and through us. And that is precisely why our mathematic algorithms correspond to this universe's mathematic algorithms. Why? Because, as the Navaho might say, we are born to this universe. We are reflexive articulations of it.

In other words, we don't have to evoke the secretions of the Cartesian pineal gland, the spirits of a Hegelian dialectical history, the sensations of a Heideggerian phenomenological consciousness in order to connect mind and body, idea and fact, science and nature. Instead, we can note that the long evolutionary history of the signifying relations of exchange loops backward on itself over and again down the ages and pulses forward the evolutionary algorithms of life-mind-language. That is, every so called species–including ours–evolves from the signifying relations of exchange of this particular universe and every so called species–including ours–further evolves these signifying relations. And if we are signifying relations of exchange made reflexively conscious, then it should not be too surprising to discover that our mathematic algorithms of exchange correspond to this universe's mathematic algorithms of exchange. And so instead of being locked into our Anglo-Saxon analytic language, I suggest we can turn to the Navaho's synthetic language–specifically, to their fluidic participial phrases. Instead of defining the universe as an objectified thing, for example, I suggest we can define the universe as an energy-matter-exchanging-time-space-evolving-no-thing-ness-of-no-thing-ness. In this context we can recognize that energy is temporalized matter and matter is spatialized energy. We can recognize the plastic fluidity of the signifying relations of exchange. And we can recognize our clan name: we are the energy-matter-exchanging-time-space-evolving-no-thing-ness-of-no-thing-ness people.

And so I suggest, once again, that nature begins with the dynamic of exchange, culture begins with the practice of exchange, history begins with the syntax of exchange. Nature begins with the dynamic exchange of energy and matter, culture begins with the practical exchange of signifiers and signifieds, history begins with the syntactic exchange of time and space. And yet that raises the next question: How, exactly, do the signifying relations of exchange evolve? I suggest that the innovative-generative algorithms of multiplication and variation loop back on themselves and evolve the conservative-restrictive algorithms of selection and adaptation. In other words, the more successful signifying relations of exchange are repeated more regularly, the less successful signifying relations of exchange are repeated less regularly. Success, in this context, refers to the relative value of the more optimal ecological articulations of exchange. As a result, the more successful signifying relations of exchange evolve the selection criteria of exchange and the selection criteria of exchange evolve the more successful signifying relations of exchange. They are modified-selected-adapted over and again down the ages as they continue to evolve new algorithms of exchange.

In short, as the more successful signifying relations of exchange loop back on themselves over and again, they evolve new relative algorithms which evolve new complex algorithms which evolve new reflexive algorithms. In turn, these new relative-complex-reflexive algorithms of the signifying relations of exchange loop back on themselves and evolve new levels-dimensions-scales and velocities of exchange. In this way the relatively less complex co-incidental micro-median-macro eco-matrices of the energy-matter-exchanging-time-space-evolving-no-thing-ness-of-no-thing-ness sometimes evolve the relatively more complex co-incidental micro-median-macro

eco-matrices. The relative algorithms of energy and matter, for example, evolve the complex algorithms of stars and planets. However, it is only when the relatively complex algorithms of exchange evolve the reflexively complex algorithms of exchange that the metabolism of exchange–i.e. life–evolves. In this context I suggest that just as the dominance hierarchies of the logic-grammar-rhetoric of exchange have defined the dominant theories of nature-culture-history, so too they have defined the dominant theories of relativity-complexity-reflexivity.

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In his book, *At Home in the Universe* (1995), Kauffman notes that, "Most of my colleagues believe that life emerged simple and became complex. They picture nude RNA molecules replicating and replicating and eventually stumbling on and assembling all the complicated chemical machinery we find in a living cell. Most of my colleagues also believe that life is utterly dependent on the molecular logic of template replication, the A-T, G-C Watson-Crick pairing...." Kauffman continues, "I hold a renegade view: life is not shackled to the magic of template replication, but based on a deeper logic. I hope to persuade you that life is a natural property of complex chemical systems, that when the number of different kinds of molecules in a chemical soup passes a certain threshold, a self-sustaining network of reactions–an autocatalytic metabolism–will suddenly appear. Life emerged, I suggest, not simple, but complex and whole, and has remained complex and whole ever since..." (*AHU*, 47-8). We can translate Kauffman's somewhat confusing terms into the somewhat clearer terms of our evolutionary-historical theory of the logic-grammar-rhetoric of the signifying relations of exchange.

In effect, Kauffman argues that most biologists believe that the surface rhetoric of the phenomenal emergence of life can be reduced to the median grammar of the functional template of DNA. However, he wants to take that standard argument a step further. He suggests that the median grammar of the functional template of DNA can be further reduced to the deep logic of the structural interactions of chemicals. In fact, he argues that the phenomenal rhetoric of life emerges directly from the structural logic of chemicals. That is, he explicitly rejects the mediating role of the functional grammar of genetics: "I hold that life, at its root, does not depend on the magic of Watson-Crick base pairing or any other specific template replicating machinery" (*AHU*, 50). Kauffman, like Derrida, explicitly rejects the mediating role of a functional grammar. While Derrida goes on to deconstruct the binary oppositions of phenomenal rhetoric and structural logic, Kauffman goes on to reconstruct their working relationship. He suggests that life emerges "whole" from the "phase transition" of relatively less complexly interactive chemicals to relatively more complexly interactive chemicals (*AHU*, 48). In other words, he suggests that the phenomenal rhetoric of life emerges directly from the structural logic of self-organizing, autocatalytic, interactive chemical systems. And that is precisely why Kauffman must evoke a bit of his own stage magic. He must evoke the magical metaphor of a "phase transition." Why? Precisely because that magical metaphor enables him to leap from the deep structural logic of chemicals to the surface phenomenal rhetoric of life. In contrast I suggest that we can, once again, rehistoricize and resynthesize the logic-grammar-rhetoric of the structural-functional-phenomenal levels of empirical scientific analysis. Instead of the sudden magic of a phase transition, it is the long evolutionary history of the signifying relations of exchange that links these seemingly different levels of analysis. I suggest, for example, that the logic of exchange–what Kauffman calls chemical interactions–evolves the grammar of exchange–what Kauffman calls the genetic template–which evolves the rhetoric of exchange–what Kauffman calls metabolic autocatalysis. And of course, in turn, the metabolic rhetoric of exchange evolves the genetic grammar of exchange which evolves the chemical logic of exchange. In other words, these seemingly different levels-dimensions-scales and velocities of exchange loop back on themselves over and again down the

ages and evolve the co-incidental micro-median-macro eco-matrices of exchange. And so we don't have to evoke the sudden magic of phase transitions, the sudden magic of phenomenal consciousness, the sudden magic of emergent properties in order to leap from one spatialized level of analysis to another. Instead, we can trace the long evolutionary history of the signifying relations of exchange that links the relative-complex-reflexive algorithms of exchange.

Instead of conjuring the phenomenal magic of emergent properties from the structural science of complex systems–I am thinking here of the work of Gell-Mann, (*QJ*, 1994), Kauffman (*AHU*, 1995), Lewin (*C*, 1992) and all their heirs at the Santa Fe Institute–I am suggesting that we can outline the long evolutionary history of the relative-complex-reflexive algorithms of exchange. We can trace the step-by-step algorithmic sequences that connect the logic-grammar-rhetoric of the structural-functional-phenomenal signifying relations of exchange. We can recognize how these algorithmic sequences loop back on themselves and evolve the rhetoric-grammar-logic of the phenomenal-functional-structural signifying relations of exchange. And so we can trace the varied ways in which some of the relatively less complexly reflexive co-incidental micro-median-macro eco-matrices of the signifying relations of exchange evolve some of the relatively more complexly reflexive co-incidental micro-median-macro eco-matrices of the signifying relations of exchange. Of course that does not mean that evolutionary history is always progressing toward higher and higher levels of relativity-complexity-reflexivity. And of course that does not mean that evolutionary history is always proceeding at the slow pace of the tortoise. In fact, evolutionary history sometimes proceeds at the fast pace of the hare–but we don't have to pull a rabbit out of our hat in order to explain that fast pace. Instead, we can trace the long evolutionary history of the signifying relations of exchange which loop back on themselves over and again down the ages and evolve countless varieties of relative-complex-reflexive algorithms.

Instead of a phenomenal-structural theory of the emergence of complexity, therefore, I am proposing an evolutionary-historical theory of the evolution of relativity-complexity-reflexivity. That is, we have to argue that complexity magically "emerges" from an "adaptive system" only when we freeze and frame the signifying relations of exchange in the spatialized grids of enlightened, empirical science. Instead, I suggest we can recontextualize the evolution of complexity within the long evolutionary history of the relative-complex-reflexive algorithms of exchange. If the evolutionary history of this universe is a nearly fourteen billion year long narrative of energy and entropy, order and chaos, life and death, then how do we get from the relatively less complexly reflexive signifying relations of quantum exchange to the relatively more complexly reflexive signifying relations of genetic exchange? The extended metaphor of the so called phase transition of the so called emergence of complexity–i.e. the phenomenal leap from one spatialized level of analysis to another–actually jumps over the question of the evolutionary-historical connections linking the relatively less complexly reflexive co-incidental micro-median-macro eco-matrices of the signifying relations of exchange to the relatively more complexly reflexive co-incidental micro-median-macro eco-matrices. That extended metaphor makes it sound as if the evolutionary dynamic is, well, magical and mystical. Instead, I suggest it is historical and algorithmic. I suggest that it is the long evolutionary history of the algorithms of exchange that evolve and link the relatively less complexly reflexive co-incidental micro-median-macro eco-matrices of the signifying relations of exchange to the relatively more complexly reflexive co-incidental micro-median-macro eco-matrices. In short, the evolutionary history of relativity-complexity-reflexivity can be defined in terms of the evolutionary history of the relative-complex-reflexive algorithms of exchange. Instead of repeating the magical incantations of magical formulas, we can trace the evolutionary histories of evolutionary algorithms.

In this particular evolving universe, for example, the new relative algorithms of physical exchange–e.g.

$E = mc^2$ –looped back on themselves and evolved the new complex algorithms of chemical exchange–e.g. $H_2 + O$ = Water–which looped back on themselves and evolved the new reflexive algorithms of biological exchange–e.g. DNA + DNA = Cells. And as these new relative-complex-reflexive algorithms looped back on themselves they evolved the metabolism of exchange–or what we can now define as the co-incidental eco-matrix of life. In turn, the new relative-complex-reflexive algorithms of physical-chemical-biological exchange looped back on themselves and evolved the new relative algorithms of sensory exchange–e.g. Stimulus + Response = Reactive Behavior–which looped back on themselves and evolved the new complex algorithms of synaptic exchange–e.g. Link + Link = Ruled Behavior–which looped back on themselves and evolved the new reflexive algorithms of neural exchange–e.g. Pathway + Pathway = Recursive Behavior. And as these new relative-complex-reflexive algorithms looped back on themselves they evolved the consciousness of exchange–or what we can now define as the co-incidental eco-matrix of mind. In turn again, the new relative-complex-reflexive algorithms of physical-chemical-biological exchange and sensory-synaptic-neural exchange looped back on themselves and evolved the new relative algorithms of logical exchange–e.g. Gesture + Vocalization = Signifier–which looped back on themselves and evolved the new complex algorithms of grammatical exchange–e.g. Signifier + Signifier = Syntax–which looped back on themselves and evolved the new reflexive algorithms of rhetorical exchange–e.g. Syntax + Signification = Semantics. And as these new relative-complex-reflexive algorithms of exchange looped back on themselves they evolved the articulations of exchange–or what we can now define as the co-incidental eco-matrix of language. And, more probably, the reflexive neural exchanges of mind and the reflexive recursive exchanges of language evolved together. Similarly, these logical-grammatical-rhetorical cycles of exchange looped back on themselves and evolved the rhetorical-grammatical-logical cycles of exchange.

In sum, the relative-complex-reflexive algorithms of physical-chemical-biological exchange looped back on themselves and evolved the relative-complex-reflexive algorithms of sensory-synaptic-neural exchange which looped back on themselves and evolved the relative-complex-reflexive algorithms of logical-grammatical-rhetorical exchange. And yet, time and again, we stop at the critical juncture of the relative algorithms and the complex algorithms of exchange when we should take the next step and recognize the reflexive algorithms of exchange. In contrast, I suggest that we arrive at life-mind-language and, on another level, nature-culture-history, only when the relative algorithms of exchange and the complex algorithms of exchange loop back on themselves and evolve the reflexive algorithms of exchange. And so along with the new science of relativity and the new science of complexity I propose a new science of reflexivity. The reflexive algorithms of physical-chemical-biological exchange evolved the co-incidental eco-matrix of life; the reflexive algorithms of sensory-synaptic-neural exchange evolved the co-incidental eco-matrix of mind; the reflexive algorithms of logical-grammatical-rhetorical exchange evolved the co-incidental eco-matrix of language. In other words, the singularity of human consciousness is not so singular, rather it is part and parcel of the long evolutionary history of reflexivity. And that is precisely why I propose a new evolutionary-historical science of reflexivity.

The enlightened empirical scientists and the romantic intuitive philosophers couldn't define life-mind-language or nature-culture-history precisely because they are no-thing. While the analytic materialism of enlightened empirical science unlocked and exhumed critical thinking, nevertheless it also reified the signifying relations of exchange. Why? Because the non-identity of non-identity is invisible to the eye and inaudible to the ear. And so the non-identity of non-identity is very difficult to articulate in French, German, English–the dominant analytic languages of the European Enlightenment. As I have noted, even Darwin himself retreated from that radical thought. And so–without being aware of what they were

doing–the enlightened empirical scientists reified the evolving co-incidental micro-median-macro eco-matrices of the signifying relations of exchange. They analyzed reified things in an objectified universe because that is what they saw and heard, what they touched, smelled, tasted. As a result, they stopped time, enframed space, narrowed perception with the logical ladders, grammatical tables, rhetorical flows of natural science, natural history, natural philosophy. And they often summarized their remarkable discoveries with an algorithm, or a set of algorithms.

And yet what is an algorithm, after all, except a temporal formula of exchange? The equal sign in every equation shouts: "This can be exchanged for that!" In this way the algorithm articulates the relative values of the signifiers being exchanged as well as the relative values of the signifiers initiating the exchange. In this way contemporary scientists can finally make the transition from the empirical physics of enframed objectified things to the evolutionary history of relative signifying relations. In this way I suggest that the fundamental evolutionary dynamic of the long evolutionary history of nature-culture-history can be defined as the innovative-generative repetitions of the multiplications and variations of the signifying relations of exchange and the conservative-restrictive repetitions of the selections and adaptations of the signifying relations of exchange. These innovative-generative and conservative-restrictive signifying relations of exchange looped back on themselves over and again down the ages and evolved new evolutionary algorithms of exchange which evolved new co-incidental eco-matrices of exchange. In this context I suggest that we can redefine what Paps and Holland infer as "the minimal protein-coding genome of the first animal" as an already very late algorithmic articulation of the already very long evolutionary history of the signifying relations of exchange. Similarly, I suggest that we can redefine the neural net of the latest artificial intelligence matrix as an already very much later algorithmic articulation of the already very much longer evolutionary history of the signifying relations of exchange. In other words, instead of thinking like an Anglo-Saxon empirical philosopher, we can think like an American-Navaho evolutionary historian. That is, instead of appropriating Navaho culture, we can listen to the Navaho people.

In this context I suggest that we can take Darwin-Wallace-Mendel's theory a step further by recognizing that while the species, the variety, the gene are evolutionary-historical articulations of the signifying relations of exchange, they do not explain these signifying relations. Imagine if the historical linguists argued that the alphabet explained the evolution of language. I would reply that while the alphabet is an evolutionary-historical articulation of the signifying relations of exchange, it does not explain the evolution of language. And so the focus on the species, the variety, the gene reveals the reductive, analytic, materialist bias of the enlightened scientists who reduced the reified whole to the reified part–and then couldn't put Humpty Dumpty back together again. Why this bias? Because in order to liberate themselves from the spiritual speculations of scholastic theology, the enlightened scientists needed to ground themselves in the material analyses of empirical science. They needed to ground themselves in the material world that they experienced with their five senses. And, as I have noted, they made tremendous discoveries. Similarly, the enlightened scientists who continue to pursue these empirical analyses to this very day continue to make tremendous discoveries. However, as I have also noted, the newly enlightened scientists paid a heavy price for their objective, experimental, analytic investigations. They reduced science to the quest for the material origin of empirical things instead of re-imagining science as a reflection of the long evolutionary history of the signifying relations of exchange. And so it is no coincidence that the newly enlightened explorer's quest for the origin of the Nile and the Amazon, the origin of the North and the South Pole, the origin of Species and Man, etc., etc., coincided with the newly enlightened scientist's quest for the material origin of empirical things. And since most scientists are men and since most men are notoriously bad at recognizing the critical importance of signifying relationships, then

we have the reactionary historical bias, the reactionary epistemological bias and the reactionary gender bias of the empirical science of things. No wonder, then, that the Romantic philosophers and the Romantic poets tried to put nature back together again with their intuitive evocations of the transcendental sublime. And no wonder Heidegger tried to put nature back together again with his phenomenological meditations on the emergence of being. And no wonder they failed.

In other words, I suggest that instead of enframing and universalizing the enlightened world of hard empirical facts, or the romantic world of soft transcendental visions, or the postmodern world of plastic deconstructive simulations, we can re-historicize and critique the postmillennial world of the signifying relations of exchange. In this context I suggest that the signifying relations of exchange link the nature of nature, the nature of culture, the nature of history in a continuous evolutionary-historical narrative or, rather, in a continuous series of local-global-universal evolutionary-historical narratives that are neither coordinated in space, nor synchronized in time. That is, evolutionary history does not evolve everywhere in the same way, at the same time, in the same stages. As Einstein suggested, space-time is relative. Life evolved here on earth, for example, over three billion years ago, but we have no idea where else or when else it might also have evolved. Similarly, one culture and one generation articulates some eco-matrices of the signifying relations of exchange and another culture and another generation articulates other eco-matrices. And while some of these cultures, generations, eco-matrices overlap, nevertheless that does not guarantee that they are coordinated in space or synchronized in time. As a result, tremendous conflicts and contradictions emerge from the competitive and cooperative practices of exchange-signification-value. And that is precisely why evolutionary history cannot just be analytic, empirical, descriptive, but must also be synthetic, critical, reflexive. The conflicts and contradictions of culture are not only natural and inevitable, but also cultural and historical. Marx was catastrophically wrong about many things, but he was exactly right when he said, "Men make their own history, but they do not make it as they please; they do not make it under circumstances of their own choosing..." (*EB*, 9). And so we must reflexively critique the varied ways in which women and men make their own history–the varied ways in which we embody, enact, evolve the dynamic-practice-syntax of exchange.

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Just as the theories of the origin of nature confuse the articulations of evolutionary history with the dynamics of evolutionary history, so too the theories of the origin of culture confuse the articulations of evolutionary history with the practices of evolutionary history. They confuse the articulations with the explanations. As I have suggested, the long evolutionary history of the signifying relations of exchange evolved the so called genus and species *Homo sapiens* and then, in turn, the so called genus and species *Homo sapiens* evolved the long evolutionary history of the signifying relations of exchange. That is, the signifying relations of exchange evolved the evolutionary algorithms of exchange which evolved the co-incidental eco-matrices of modern human beings and modern human culture. In this context I suggest that the long evolutionary history of the cumulative advantages of the particular ratios of the innovative-generative repetitions and the conservative-restrictive repetitions of the relative-complex-reflexive algorithms of the signifying relations of exchange evolved modern human beings and modern human culture.

Homo sapiens, as a modern species with a modern culture, therefore, did not only appear with a shift in climate; a thinning of the forest; a descent from the trees; a longer pair of legs; a bipedal gait; an erect stance; a freer pair of arms and hands; a narrower stomach; a shorter jaw; a smaller set of teeth; a flatter face; a bony middle ear; a larger fissured brain; a synaptic matrix; a scavenging-foraging family; a mastery of tools; a control of fire; a harvest of seafood; a facility with projectile weapons; a hunting-gathering

band; a higher protein diet; a genetic mutation; a neural reorganization; a cognitive awareness; a behavioral adaptability; a linguistic fluency; an innovative creativity; a division of labor; a surge in population; a denser demographics; a warring-bartering tribe; a more efficient immune system; a collective capacity to imitate, learn, adapt; an improved memory; a totemic clan; a prohibition of incest; a requirement of exogamy; a lineage system; a kinship altruism; a reciprocal altruism; a structural logic; a functional grammar; a phenomenal rhetoric; a genetic bio-logic; a modular psycho-grammar; a memetic socio-rhetoric; an ability to think, plan, imagine; a proficiency with mythic, religious, dramatic narratives; a readiness for abstraction, representation, symbolization; a talent for painting, music, art; a herding-farming settlement; a trading-meeting village; a market-festival town; a manufacturing-commercial city; a channeling of energy flows; an increasing complexity; a gathering and reading of information, etc., etc. Klein cites several of these theories of the origin of culture and I have added several more from different fields of study. While each one of these theories evoke a different factor of evolutionary history, none of them actually explain the dynamic-practice-syntax of evolutionary history.

In contrast, I suggest that *Homo sapiens* as a modern species with a modern culture evolved via the long evolutionary history of the cumulative advantages of the particular ratios–what we can call the Quixt Ratios–of the innovative-generative repetitions and the conservative-restrictive repetitions of the mutually reinforcing successes of the relative-complex-reflexive algorithms of the signifying relations of exchange. These evolutionary algorithms selected for the synergistic relativity of social individuals with social skills; they selected for the synergistic complexity of social individuals with social brains; they selected for the synergistic reflexivity of social individuals with social minds–and so they evolved the relative-complex-reflexive co-incidental eco-matrices of modern human beings and modern human cultures. In this context we can return to our earlier argument and recall our definition of life as a relative-complex-reflexive co-incidental eco-matrix of the metabolic dynamic of exchange; our definition of mind as a relative-complex-reflexive co-incidental eco-matrix of the neural dynamic of exchange; our definition of language as a relative-complex-reflexive co-incidental eco-matrix of the recursive dynamic of exchange. The hard-nosed empirical philosopher who argues that consciousness in and of itself does not exist ought to argue, if he were consistent, that life-mind-language in and of themselves do not exist. Of course, life-mind-language do not exist in and of themselves as empirical objectified things precisely because they are further articulations of the long evolutionary history of the relative-complex-reflexive signifying relations of exchange. The signifying relations of life-mind-language evolved various social groups and various social groups evolved the signifying relations of life-mind-language. And of course these social groups offered enormous adaptive advantages over the isolated lives of isolated individuals.

Klein states that, "If we accept that modern human behavior provided the competitive advantage that allowed modern humans to spread from Africa, it remains uncertain what promoted behavioral advance. Did it follow strictly on social, economic, or technological change, as most specialists believe, or was it sparked by a neurological change that fostered fully modern cognitive ability?" (*HC*, 721-2). However, instead of choosing between the alternatives of either social-economic-technological change or genetic-neural-psychological change as the explanation for the origin of culture, I am suggesting that the signifying relations of exchange evolved the evolutionary algorithms of exchange which evolved the Quixt Ratios of exchange which evolved the sustainable, co-incidental, micro-median-macro eco-matrices of exchange which we objectify as nature-culture-history. They evolved, for example, new signifying relations of energy and matter, time and space, stars and planets, earth and air, fire and water. They evolved life-mind-language. They evolved families-bands-tribes, villages-towns-cities, kingdoms-nations-states.

They evolved obligations-ethics-rules, rights-duties-laws, rituals-traditions-institutions. They evolved myths-epics-dramas, religions-politics-philosophies, natural sciences-social sciences-humanities. They evolved evolutionary histories. They evolved sentence after sentence, including the very sentences in this very text and including this very sentence. And so, yes, this very study is no-thing more and no-thing less than a further articulation of the long evolutionary history of the relative-complex-reflexive algorithms of the signifying relations of exchange. This very study is no-thing more than a co-incidental eco-matrix of the signifying relations of exchange.

Of course, the evolutionary-historical articulations of the signifying relations of exchange evolved more slowly or more quickly depending upon the minor or major, slow or fast changes in the selection criteria which evolved, and which were evolved by, the evolutionary algorithms of exchange. That is, the evolutionary-historical velocity of these evolutionary-historical innovations depended upon the various catalysts of evolution, the various selection criteria of evolution, the various evolutionary algorithms of evolution, the various Quixt Ratios of evolution, etc., etc. They depended upon how long the particular innovative-generative signifying relations of exchange could be repeated and sustained and how long the particular conservative-restrictive signifying relations of exchange could be repeated and sustained. In short, the four R's–relations-repetitions-ratios-reflexivity–are critical to the long evolutionary history of the co-incidental micro-median-macro eco-matrices of exchange. And so, for example, the evolutionary algorithms of natural selection evolved the evolutionary algorithms of cultural selection which evolved the evolutionary algorithms of historical selection. In turn, the consequent evolution of the-relative-complex-reflexive-co-incidental-eco-matrix-of-the-signifying-relations-of-exchange-that-we-call-consciousness means that we cannot reduce the evolutionary algorithms of historical selection to the evolutionary algorithms of cultural selection to the evolutionary algorithms of natural selection–that is the scientistic mistake that the social darwinists, behavioral psychologists, sociobiologists, etc., etc., make. Again, instead of searching for the mythic origin of nature-culture-history, I suggest we can trace the long evolutionary history of the signifying relations of exchange which evolve the evolutionary algorithms of exchange which evolve the Quixt Ratios of the sustainable, co-incidental, micro-median-macro eco-matrices of exchange.

In this context the new reflexive possibilities of symbolic representation, linguistic expression, technological sophistication evolved with, in, through our so called species. The genetic bottleneck of our so called species which occurred approximately 70,000 to 60,000 years ago–caused, perhaps, by a prolonged drought–was also a cultural bottleneck. That is, the few tens of thousands or so fertile *Homo sapien* couples who came through the genetic bottleneck may have survived precisely because they were already in the process of evolving the signifying relations of exchange which were already in the process of evolving the evolutionary algorithms of exchange which were already in the process of evolving the co-incidental eco-matrices of exchange that we call culture. Instead of evolving the bigger teeth of the saber-tooth tiger, our ancestors evolved the sustainable co-incidental eco-matrices of scavenging-foraging families, hunting-gathering bands, warring-bartering tribes. In turn, they evolved the sustainable co-incidental eco-matrices of herding-farming settlements, trading-meeting villages, market-festival towns, manufacturing-commercial cities, etc., etc.

In fact, I suggest that different species evolved as different expressions of the maximization-optimization-articulation of different sets of the genetic algorithms of exchange: e.g. the algae's color; the ant's legs; the eagle's wings, the peacock's tail, the owl's eyes, the fox's ears, the tiger's teeth, the giraffe's neck, the elephant's trunk, the chimpanzee's hands–and the human's brain. These varied forms of genetic maximization-optimization-articulation cannot be explained by natural and sexual selection alone. In this context we might ask, for example, Why giraffes?

Neither the theory of natural selection, nor the theory of sexual selection offer any positive explanation as to why giraffes exist. And yet I suggest that a theory of the algorithmic exuberance of the signifying relations of exchange explains that giraffes exist because, like other species, they maximize-optimize-actualize particular sets of particular genetic algorithms. In other words, nature poses the same question over and again: What if we maximize-optimize-actualize the set of genetic algorithms for, respectively, color, legs, wings, tails, eyes, ears, teeth, necks, trunks, hands–and brains?

Aristotle and Darwin both sensed the algorithmic exuberance of nature when they argued for the teleological drive toward the perfection of form, but their teleological arguments, as teleological arguments, reveal that their respective natural histories were too much indebted to Plato's supernatural myth. They both suggested that the imperfect grammatical forms of the natural world were striving toward the perfect logical essences of the supernatural world. In contrast, I am not arguing for the teleological drive toward the perfection of form, rather I am arguing for the algorithmic exuberance of genetic articulation. And so while the morphology of the primate body of *Homo sapiens* has been relatively stable for about 200,000 years, that doesn't mean that it isn't still evolving. In fact, our bodies and our minds are still evolving together. The nutritional health benefits and the educational social benefits of some cultures, for example, have evolved stronger, taller, larger human body forms along with more literate, numerate, technological human cognitive forms. And yet, as Darwin notes in *The Descent of Man* (1871), these kinds of evolutionary distinctions are the by-product of the socio-economic selection processes of different socio-ecologies–and not an expression of any supposed innate superiority or inferiority of race. In other words, the radical implications of the radical theory of the evolution of no-thing-ness explodes the conservative myth of the essential identity of race–and therefore of racism. While Darwin does not pursue the radical implications of his radical theory in *On the Origin of Species*, nevertheless he does return to one of those radicals implications–i.e. the explosion of the conservative myth of racism–with great effect in *The Descent of Man*. And yet, after the firestorm of public controversy sparked by his broadly conceived evolutionary narratives, Darwin withdrew to the peace and quiet of his narrowly defined empirical studies. He wrote one monograph on emotions, seven monographs on plants and animals and a final monograph on the ecological impact of earthworms.

In any case, the more recent archaeological discoveries of evolutionary anthropology lead to a further question: If the modern morphology of *Homo sapiens* had already evolved about 200,000 years ago, then why did the modern anthropology of *Homo sapiens* only emerge about 70,000 to 50,000 years ago? What took so long? I suggest it took another 150,000 years for the signifying relations of exchange to evolve the evolutionary algorithms of exchange which evolved the Quixt Ratios of exchange which evolved the sustainable co-incidental eco-matrices of exchange that we call modern human culture. That is, it took another 150,000 years for the relative algorithms of exchange to evolve the complex algorithms of exchange and for them to evolve the reflexive algorithms of exchange. I suggest it took another 150,000 years for the algorithms of an articulate, acculturated, reflexive human community to evolve.

And, yet again, with that new expression of evolutionary relativity-complexity-reflexivity, the analytic narratives of nature must necessarily merge with and must necessarily evolve into the synthetic narratives of culture and history. And, yet again, that is the critical shift in historical consciousness that the social darwinists, behavioral scientists, sociobiologists, etc., etc. fail to make. They reduce the reflexive syntax of historical exchange to the complex practice of cultural exchange to the relative dynamic of natural exchange. They reduce recursive behavior to ruled behavior to reactive behavior. They reduce the rhetoric of history to the grammar of culture to the logic of nature: i.e. mathematics, physics, chemistry; genetics, cybernetics, memetics; cosmology, ecology,

climatology; biology, demography, neurology; etc., etc. Of course the reduction of the rhetoric of history to the grammar of culture to the logic of nature has generated many deep insights. And yet I suggest that the study of an articulate, acculturated, reflexive human community requires a further advance. It requires the re-integration of the logic-grammar-rhetoric of nature-culture-history in reflexive, critical, postmillennial evolutionary-historical narratives of the signifying relations of exchange.

If the Quixt Ratios of exchange slid too far toward the innovative-generative range of multiplication and variation, for example, then the practices of exchange couldn't evolve a sustainable communal synergy–they would be too dynamically unstable. If the Quixt Ratios of exchange slid too far toward the conservative-restrictive range of selection and adaptation, then the practices of exchange couldn't evolve an adaptable communal synergy–they would be too rigidly stable. And who knows how many hominin gatherings failed to evolve a flexible-yet-stable and a stable-yet-flexible communal synergy and so disappeared from history? Who knows how many hominin gatherings failed to evolve the precise ratios of exchange that led to the adaptive advantages of cultural survival? The lost histories of the lost are as important to the evolutionary narratives of evolutionary history as the found histories of the found. They are the missing evolutionary algorithms–the deselected evolutionary algorithms–in the optimization protocols of exchange.

As Klein notes, the archaeological record reveals that the Neanderthals made the same heavy stone hammers and the same thick stone blades millennia after millennia. And so I suggest that the Quixt Ratios of the Neanderthal signifying relations of exchange slid toward the conservative-restrictive range of selection and adaptation and, as a result, the evolution of a reflexive Neanderthal culture slowed to a crawl. In contrast, I suggest that the Quixt Ratios of the *Homo sapien* signifying relations of exchange slid toward the innovative-generative range of multiplication and variation and, as a result, the evolution of a reflexive *Homo sapien* culture quickened to a race. And perhaps the Neanderthals could have emerged from the *cul de sac* of their too conservative-restrictive Quixt Ratios of exchange–except they ran out of time. Wave after wave of *Homo sapiens* followed the Neanderthals out of Africa and into the Near East and Europe. They bred with them, competed with them and perhaps even wiped them out with some kind of pandemic disease. Perhaps the few ten thousands or so fertile *Homo sapien* couples who came through the genetic bottleneck of about 70,000 years ago were not only the acculturated survivors of a prolonged drought, but also the acculturated survivors of some kind of pandemic influenza. And perhaps that acculturated sub-species–precisely because of their more innovative-generative Quixt Ratios of exchange–were able to evolve a solution to the drought and a resistance to the disease. Perhaps, for example, they were able to evolve more sustainable practices of mutual aid. We often forget that the social exchanges of inclusive cooperation are as powerful an evolutionary force as the social exchanges of exclusive competition.

And so perhaps when the much larger population of the much more innovative-generative *Homo sapiens* first came into contact with the much smaller population of the much less innovative-generative Neanderthals, they brought some kind of pandemic influenza with them. As Houldcroft and Underdown suggest, "The transfer of pathogens between hominin populations... may also have played a role in the extinction of the Neanderthals..." (*AJPA*, 04/10/16). And so perhaps the Neanderthals died out as a result of their much too conservative Quixt Ratios, their much too different immune systems, their much too limited practices of mutual aid. As a result, the Neanderthals only survive as traces in one to four percent of modern human DNA. And yet the fate of the Neanderthals requires us to consider the fate of our own so called species. Have the Quixt Ratios of contemporary culture become, once again, unsustainable? Have they split down the middle and slid to the extremes? Have our innovative-generative technologies of exchange become too flexible and unstable? Have our conservative-restrictive institutions of exchange become too stable

and inflexible? In other words, as I have suggested, we must write the evolutionary histories of the signifying relations of exchange in a hermeneutical mirror.

We have only begun to explore the radical implications of our new general theory of evolution and our new general theory of evolutionary history. We have only begun to trace the long evolutionary history of the signifying relations of exchange. We have only begun to explain how the signifying relations of exchange evolve the evolutionary algorithms of exchange which evolve the eco-matrices of exchange. And yet we have shifted the study of nature-culture-history from the search for a theory of every-thing to the discovery of a theory of no-thing.

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Uma teoria de nada

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Tradução de Tatiana Massuno

Resumo

Como podemos definir uma nova teoria geral da evolução e, consequentemente, uma nova teoria geral da história evolucionária? Primeiramente, precisamos resolver o mistério que se encontra no centro do grande livro de Darwin. Em segundo lugar, temos que identificar os começos de natureza-cultura-história. Darwin não pôde definir o termo espécie e seus sucessores não conseguem definir o termo gene. Uma solução padrão para este dilema é definir uma espécie enquanto um grupo de organismos dimórficos que, de forma bem sucedida, troca genes. No entanto, algo indefinível não pode ser utilizado para definir outra coisa indefinível. Ao invés de detectar a evolução das coisas indefiníveis, podemos traçar a evolução de relações definíveis - p. ex. a troca. Trocar significa colocar em relação e, dessa forma, significar os valores relativos dos significantes sendo trocados, assim como os valores relativos dos significantes iniciando a troca. Nesse contexto sugiro que a natureza comece com a dinâmica da troca; cultura, com a prática da troca e a história, com a sintaxe da troca. Ao invés de uma teoria de tudo, proponho, dessa maneira, uma teoria de nada. Proponho que nada existe em e de si mesmo e que tudo evolui como uma eco-matriz coincidental das relações significativas de troca.

Palavras-chave

história evolutiva, teoria da troca, complexidade, reflexividade, teoria do nada, teoria do nada, teoria do tudo, origem da cultura.

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Como podemos definir uma nova teoria geral da evolução e, consequentemente, uma nova teoria geral da história evolucionária? Primeiramente, precisamos resolver o mistério que se encontra no centro do grande livro de Darwin. Em segundo lugar, temos que identificar os começos de natureza-cultura-história.

Na introdução para "A Origem das Espécies" (1859), Darwin resume a sua teoria malthusiana da evolução: "Como, de cada espécie, nascem muito mais indivíduos do que o número capaz de sobreviver, e, como, consequentemente, ocorre uma frequente retomada da luta pela existência, segue-se daí que qualquer ser que sofra uma variação, mínima que seja, capaz de lhe conferir alguma vantagem sobre os demais, dentro das complexas e eventualmente variáveis condições de vida, terá maior condição de sobreviver e de ser, dessa maneira, naturalmente selecionado. E, em virtude do poderoso princípio da hereditariedade, qualquer variedade que tenha sido selecionada tenderá a propagar sua nova forma modificada". (OS, 6). Dessa maneira, Darwin responde a pergunta proposta pelo seu título: A origem das espécies pode ser localizada na dinâmica evolucionária de multiplicação e variação, seleção e adaptação. Ele detalha melhor essa dinâmica no resto de seu grande livro. Caso encerrado.

Mas ainda não tão rápido. Na realidade, o caso permanece em aberto porque o mistério que reside no coração do grande livro de Darwin permanece sem solução. Podemos começar novamente com a pergunta

proposta pelo título de Darwin: Qual é a origem das espécies? Quando Darwin tenta definir seus termos básicos, ele reconhece que: "Certamente nenhuma linha clara foi ainda demarcada entre espécies e subespécies ...e novamente entre subespécies e variedades bem marcadas ou entre variedades menores e diferenças individuais". (OS, 44). E depois admite que: "Eu vejo o termo espécies como sendo arbitrariamente atribuído por conveniência a um grupo de indivíduos que muito se assemelham, e que não se difere essencialmente do termo variedade, que é atribuído a formas menos distintas e mais flutuantes. O termo variedade, novamente, em comparação com meras diferenças individuais, é também aplicado de forma arbitrária, e por mera conveniência". (OS, 45). Em outras palavras, Darwin admite não conseguir distinguir espécies de subespécies, uma subespécie de uma variedade, uma variedade de uma diferença. Admite que o que ele e seus colegas naturalistas definem como a identidade essencial de uma espécie é na realidade nada mais que uma coleção conveniente de similaridades formais de um grupo arbitrário de diferenças aparentes. Admite que espécie é indefinível. Em resumo, no segundo capítulo de seu grande livro, Darwin confronta as implicações radicais de sua teoria radical da evolução: ou seja, a origem não tem originalidade e espécies não têm especificidade. E assim o título de Darwin, *A Origem das Espécies*, juntamente com a questão por ele proposta, é fantasticamente irônico. E aqui confrontamos o mistério que reside no coração de seu grande livro: Se não é a espécie que está evoluindo, o que exatamente está?

Darwin foi, em primeiro lugar, um biólogo de campo empirista, um pesquisador de laboratório empirista, um historiador natural empirista. Ele foi, em segundo lugar, e de forma hesitante, um teórico evolucionário. E não é de se admirar que ele tenha hesitado – dada a autoridade religiosa da história bíblica na Inglaterra e Europa nos meados do século XIX. Ele finalmente apresentou e publicou sua teoria Mathusiana da evolução somente após Wallace o ter enviado um esboço de sua versão, independentemente articulada, dela. Mesmo assim, Darwin continuou a lutar com as implicações radicais de sua teoria radical ao longo de seu grande livro. Ele reconhece, por exemplo, que o fluxo temporal da história evolucionária enfraquece a tabula espacial da história natural, como também a escada vertical da história metafísica. Especificamente, ele reconhece que se o fluxo temporal interminável de diferenças aparentes admite "nenhuma linha de demarcação clara" então ele e seus colegas naturalistas têm de abandonar a tabula espacial de similaridades formais de Lineu e a escada vertical de identidades essenciais de Lamarck. No entanto, ao invés de perseguir as implicações radicais de sua teoria radical, Darwin imediatamente se esquiva delas. Ele tenta encravar a sua teoria temporal da história evolucionária novamente na teoria espacial da história natural de Lineu. E, assim como veremos, ele finalmente tenta elevar a sua história evolucionária de diferenças aparentes e a história natural de similaridades formais de Lineu de volta à escada de história metafísica de identidades essenciais de Lamarck. E ele bufa e sopra com todo o tipo de qualificações e racionalizações na medida em que luta para atingir aquele objetivo.

Logo após admitir não poder estabelecer os limites entre uma diferença, uma variedade, uma subespécie e uma espécie, Darwin retorna à tarefa de estabelecer os limites. Ou seja, ele retorna à tarefa de elaborar as tabulas espaciais da história natural: "Imaginei que alguns resultados interessantes pudessem ser obtidos com relação à natureza e relações das espécies que mais variam, ao tabular todas as variedades em várias floras bem trabalhadas" (OS, 45). Apesar de reconhecer algumas das dificuldades relacionadas a elaborar novas tabulas espaciais no contexto de sua nova teoria temporal, ele anuncia que "Deixarei para meu trabalho futuro a discussão dessas dificuldades" (OS, 45). Em outras palavras, Darwin adia a questão do tempo para outro momento porque ele não tem tempo de abordá-lo – e porque não sabe como fazê-lo. Ele libera o gênio temporal da história evolucionária das limitações espaciais da história natural e depois tenta colocar o gênio novamente na lâmpada – ou, nesse caso, de volta à caixa de Lineu. E então, não surpreendentemente, as conclusões gerais que tira de suas novas tabulas histórico-naturais são repletas de equívocos histórico-evolucionários. Ele

afirma, "Portanto é....a espécie dominante...que mais frequentemente produz variedades bem marcadas, ou como as considero, espécies incipientes" (OS, 46). Ele relembra: "Vimos que não existe um critério infalível para distinguir espécies e variedades bem marcadas... (OS, 48). E assim ele luta com as contradições da estrutura espacial que ele tenta reinstituir na sua narrativa temporal.

Nesse contexto Darwin se volta a racionalizações de analogia e médias. Explica que quando ele e seus colegas naturalistas consideram duas variedades relacionadas, eles: "...são compelidos a chegar a uma determinação pela quantidade de diferença entre eles, ao julgar por analogia se a quantidade basta para elevar uma ou outra à categoria de espécie" (OS, 48). E ele concorda com seus colegas que sugerem que: "... com relação a plantas ...e insetos...a diferença entre espécies é excessivamente pequena." Continua:" Tentei testar isso numericamente por médias..." (OS, 48). E mesmo assim novamente reconhece que, "Finalmente, portanto, variedades têm as mesmas características gerais que as espécies, uma vez que não podem ser distinguidas das mesmas..." (OS, 49). Enquanto os fluxos temporais da teoria da história evolucionária de diferença aparente de Darwin não podem ser contidos nas redes espaciais da história natural de similaridades formais de Lineu, ou ainda, sustentados pelos degraus verticais da história metafísica de identidade essencial de Lamarck, mesmo assim Darwin continua a retornar às redes de Lineu e, finalmente, aos degraus de Lamarck. E, novamente, Darwin é primeiramente um biólogo de campo empirista, um pesquisador de laboratório empirista e um historiador natural empirista. Sempre que confronta o pensamento radical da não identidade da não identidade, ele rapidamente retorna as suas pressuposições empíricas. E podemos apenas admirar a forma como ele luta para dar à luz a sua radical teoria retórica neossocrática da história evolucionária no contexto da moderada teoria gramatical neoaristotélica da história natural de Lineu e a conservadora teoria lógica neoplatônica da história metafísica de Lamarck.

No final de seu grande livro Darwin mais uma vez retorna à retórica neossocrática da não identidade da não identidade – ou seja, aos fluxos temporais de aparências flutuantes de diferença. Conclui, "resumindo, teremos que tratar espécie da mesma forma que aqueles naturalistas tratam gêneros, que admitem que gêneros são meramente combinações artificiais feitas por conveniência. Pode não ser uma perspectiva animadora; mas nós iremos pelo menos nos liberar da busca vã pela irrevelada e irrevelável essência do termo espécie" (OS, 392). Darwin admite, novamente, que não há algo como uma distintamente identificável espécie que possa ser claramente demarcada. E ao mesmo tempo ele não dá o próximo passo. Não admite que já que não podemos definir espécie, não podemos descobrir a origem das espécies. Ao invés disso, no final de seu grande livro, ele invoca a radical retórica neossocrática da exigência da aparência – por exemplo, "mas nós iremos pelo menos nos liberar da busca vã pela irrevelada e irrevelável essência do termo espécie" (OS, 392); uma moderada neoaristotélica gramática da teleologia da forma – por exemplo," E como a seleção natural trabalha basicamente por e para o bem de cada ser, todos os dotes corporais e mentais tenderão a progredir até a perfeição (OS, 395); e uma conservadora lógica neoplatônica da ontologia da essência – por exemplo," Portanto devo inferir por analogia que provavelmente todos os seres orgânicos que já viveram nessa terra descenderam de outra forma primordial, na qual a vida foi soprada pelo Criador". (OS, 391). Na realidade, pesquisa genética recente sugere que todas os animais vivos evoluíram de um ancestral comum que existiu há cerca de 650 milhões de anos atrás. Paps e Holland "...usando extensiva comparações de genoma...inferem o genoma mínimo de codificação de proteínas do primeiro animal ..." (NC, 04/30/18). Em um feito notável de genética devolucionária, eles inferem a identidade de 6,331 genes no genoma primevo. No entanto, isso requer um salto de fé, a cadeia dos seres, ou a escada da metafísica para ir do genoma primevo até o que Darwin chama de o sopro do Criador.

Derrida diria que a lógica estrutural da história metafísica de Darwin e a retórica fenomenal da história evolucionária de Darwin se desconstroem. De acordo com Derrida, todo texto é uma batalha de

inteligência entre o Rei da Lógica e o Bobo da Corte da Retórica, entre a tragédia de Lear e a comédia do Tolo, entre a estrutura de sentido e os fenômenos de interpretação. Como resultado, todo texto cai no abismo pós-moderno da significação. E ainda devemos notar que é Derrida ele mesmo que abre aquele abismo pós-moderno quando agrupa e elide a gramática funcional da narrativa. É o próprio Derrida que quebra o link gramatical entre lógica e retórica. Por que quebra o link? Ele o faz para mostrar como o ardil da lógica constrói hierarquias de sentido no texto e como o jogo da retórica solapa as hierarquias de interpretação na mente. No entanto, Derrida paga um alto preço por suas revelações fenomenológica-desconstrutivistas. Ele joga todo texto no abismo pós-moderno de significação que não pode ser colmatado pelas narrativas da história.

Ao invés de desconstruir a oposição binária da lógica estrutural de Darwin e sua retórica fenomenal, portanto, quero re-historicizar a economia trinaria da lógica estrutural, gramática funcional e retórica fenomenal de Darwin. Quero sugerir que quando Darwin confronta a retória fenomenal de diferença aparente – isto é a não originalidade da origem, a não especificidade da espécie, a não essencialidade da essência – ele se retira daquela retórica fenomenal ao escrever uma nova versão da gramática funcional de similaridade formal de Lineu e uma nova versão da lógica estrutural da identidade essencial de Lamarck. A cada nova edição de seu grande livro, Darwin luta para reconciliar sua versão da história evolucionária temporal com sua versão da história natural espacial de Lineu e sua versão da história metafísica hierárquica de Lamarck. No entanto, sua tentativa de reconciliar a retórica-gramática-lógica de sua narrativa evolucionária falha. Como resultado, o mistério que reside no coração de seu grande livro permanece não solucionado: se não são as espécies que estão evoluindo, o que está exatamente?

Darwin sabia da existência de uma lógica implícita ao processo evolucionário de descendência com modificação, mas admite que: "...as leis que governam a herança são bastante desconhecidas..." (OS, 13). E então ele recorre a eufemismos genéricos. Ele se refere aos "fortes princípios da herança" (OS, 6). Ele pensa, "Qualquer que seja a causa da menor diferença na cria..." (OS, 139). E cita: "As complexas e pouco conhecidas leis que governam a variação ..." (OS, 381). É claro, Darwin não sabia nada sobre genética. Mendel começou a criar suas plantas de ervilha em 1854, mas não publicou os resultados até 1866 – sete anos após Darwin ter publicado seu grande livro. Uma cópia sem cortes do artigo obscuro de Mendel foi encontrado na biblioteca de Darwin (Henig, MG, 143). Presumivelmente, Mendel o enviou uma cópia e, evidentemente, Darwin nunca a leu. Ao invés de focar na lógica genética da modificação assim como articulada em múltiplas gerações de plantas de ervilha, Darwin começa sua discussão sobre evolução com as leis genéricas de modificação tal como articuladas nas múltiplas gerações de pombos. Mendel criou plantas de ervilha; Darwin, pombos. E enquanto Darwin nem mesmo entendia como as leis genéricas de modificação se davam – ele achava que os filhos tinham mais ou menos a média dos traços de seus pais – ele reconhecia que ele e seus colegas criadores de pombos podiam manipular as leis lógicas de modificação através das regras gramaticais de seleção. Ou seja, ele e seus colegas criadores selecionavam e acasalavam pássaros com os mesmos traços que eles queriam e, dessa forma, eles domesticaram mais a lógica natural da modificação, a gramática natural de seleção, a retórica natural de adaptação. E mesmo assim Darwin ainda não conseguia distinguir um grupo de diferenças de uma variedade, uma variedade de uma subespécie, uma subespécie de uma espécie.

Na realidade, todo o argumento do livro de Darwin ironicamente intitulado, *A Origem das Espécies*, prova que não há algo como a origem das espécies. Não há algo tal como uma distinção, uma variedade, uma espécie com origem-essência-identidade. A preposição frequentemente omitida que inicia o título de Darwin nos lembra de que Darwin na realidade não descobre a origem das espécies, descreve, ao invés, uma dinâmica evolucionária que solapa a própria ideia de uma origem original, uma espécie específica, uma essência essencial. E assim ele luta para elaborar uma nova economia histórico-evolucionária da lógica-

gramática-retórica da modificação-seleção-adaptação de distinções-variedades-espécies. E, novamente, ele não consegue. Em um parágrafo avança sua radical história evolucionária, no outro, retorna à moderada história natural de Lineu. E, no final, ele até retorna à conservadora história metafísica de Lamarck. Enquanto Darwin não persegue as implicações radicais de sua teoria radical, nós as estamos perseguindo. Se não é a identidade essencial de uma espécie que está sendo modificada-selecionada-adaptada repetidamente através das eras, então o que, exatamente, está evoluindo?

A redescoberta do trabalho de Mendel na virada do século XX e a revolução genética que se seguiu parece ter resolvido o mistério que reside no coração da teoria de Darwin e Wallace. Mendel descobriu a lógica genética- isto é as relações matemáticas – de traços específicos passados de uma geração de planta de ervilha à outra. E esta lógica genética parece ser a lógica que falta- o princípio, causa, lei que falta – da variação que Darwin não compreendeu. E, assim, podemos concluir, que é exatamente o gene – a unidade quintessencial da evolução – que está sendo modificado-selecionado-adaptado através das eras. No entanto, algo curioso aconteceu no caminho para o laboratório de genética. Assim como Darwin percebeu que não podia definir espécie, também vários geneticistas principais perceberam não poder definir gene. O que é um gene exatamente? Deveria ser definido em termos de sua configuração estrutural, sua operação funcional, sua articulação fenomenal? Deveria ser definido com relação a sua localização cromossomal, sua manifestação celular, sua geração somática? Que partes do DNA não são partes dos genes? Assim como Darwin finalmente abandona a busca por "...a irrevelável essência do termo espécie" (OS, 392), também vários geneticistas principais agora concordam que "...não há mais uma definição precisa sobre o que poderia contar como gene" (Rheinberger et al., SEP, 2015). Em suma, quanto mais de perto examinamos o limite da identidade, mais rapidamente ele se difunde em uma nuvem de diferença. Obviamente, assim como Darwin recorreu à lógica difusa da analogia e das médias para desenvolver uma ciência aproximada da modificação-seleção-adaptação das espécies, então também podemos recorrer à mesma lógica difusa para desenvolver uma ciência aproximada de modificação-seleção-adaptação dos genes. Entretanto, essa medida paliativa ainda não resolve o mistério que reside no coração da teoria de Darwin-Wallace-Mendel: O que está evoluindo exatamente? O que está sendo modificado-selecionado-adaptado?

Em contraste com a crítica nervosa de Darwin à identidade essencial de uma espécie, Klein abre *The Human Career* (2009) – sua abrangente pesquisa de livros didáticos sobre os recentes avanços na antropologia evolucionária – com a afirmação confiante que "Espécie é a menos arbitrária e mais fundamental unidade evolucionária, e deve ser compreendida antes de qualquer consideração sobre a evolução, até mesmo uma focada firmemente em uma única espécie tal como *Homo sapiens*" (HC, 1). Por que foi Darwin tão nervosamente crítico de uma ideia de identidade essencial de uma espécie e por que é Klein tão confiantemente certo dela? Precisamente porque Darwin nada sabia sobre genética e Klein sabe muito. Klein explica que, "...não importa quão detalhadas sejam as semelhanças entre dois grupos de organismos, se os indivíduos não puderem trocar genes entre grupos, as duas populações devem ser atribuídas a diferentes espécies" (HC, 1). Em outras palavras, uma espécie pode ser definida como um grupo fértil de organismos dimórficos que, com sucesso, trocam genes. E boa parte dos biólogos e antropólogos evolucionários reconheceriam a eficácia pragmática de tal definição operacional. No entanto, se espécie é indefinível e se gene é indefinível, então algo indefinível não pode ser utilizado para definir outra coisa indefinível. Em outras palavras, como o mito Hindu sugere, se a terra plana repousa nas costas de um elefante e esse elefante, nas costas que uma tartaruga e se essa tartaruga repousa nas costas de outra tartaruga, então, são tartarugas até o fim. Nesse contexto podemos levar a teoria da evolução de Darwin-Wallace-Mendel além ao resolver o mistério que reside no centro de seus argumentos.

Ao invés de rastrear a evolução das coisas indefiníveis- por exemplo, espécie, variedade, genes –

podemos identificar a evolução das relações definíveis – por exemplo, a troca. Trocar significa colocar em relação e, por conseguinte, significa valores relativos de significantes sendo trocados assim como valores relativos de significantes iniciando a troca. O valor relativo do valor pode ser entendido como o alcance das articulações ecológicas mais ótimas e menos ótimas das relações significantes de troca. Nesse contexto sugiro que natureza comece com a dinâmica da troca; cultura, com a prática da troca e história, com a sintaxe da troca. Especificamente, sugiro que as relações significativas de troca desenvolvem os algoritmos evolucionários de troca que desenvolvem as eco-matrizes de troca que desenvolvem, por exemplo, a nossa assim chamada espécie. Por sua vez, nós objetivamos as eco-matrizes de troca coincidentais de tipo micro-médio-macro e as chamamos de cordas-membranas-quarks; nós as chamamos de átomos-moléculas-células; as chamamos de genes – variedades- espécies; nós as chamamos de vida-mente – linguagem; as chamamos de natureza-cultura-história. Ao invés de procurarmos pela origem mítica da natureza-cultura-história, então, sugiro que tracemos uma longa história evolucionária das relações de troca significativas. E então, só para esclarecer, nesse estudo não estou tratando de todas as muitas, variadas relações significativas do universo, e sim de um tipo de relação significativa particular: isto é, a troca.

É claro, como um resultado da virada linguística da teoria cultural do século XX, as relações significativas de troca – como relações significativas – inspiraram uma vasta literatura que atravessa disciplinas. Vou rever e criticar uma parte selecionada dessa literatura no futuro, mas, enquanto isso, citarei três exemplos-chave para esclarecer e distinguir minha teoria. Em *The Elementary Structures of Kinship* (1949), Lévi-Strauss esboça um sistema universal de troca lógico estrutural que ele projeta na mente cibernética inconsciente. Em *The Order of Things* (1966), Foucault esboça um sistema geral de troca gramático funcional que ele projeta na mente taxonômica pré-consciente. Em *Given Time: I. Counterfeit Money* (1991) Derrida delineia um particular sistema de troca retórico fenomenal que ele projeta na mente linguística consciente. Em outras palavras, assim como Lamarck, Lineu, Darwin fetichizam respectivamente, a lógica, gramática, retórica das narrativas da história natural, também Lévi-Strauss, Foucault, Derrida fetichizam, respectivamente, a lógica, gramática e a retórica das narrativas da história cultural. Como resultado, tanto os modernos historiadores naturais e os modernos historiadores culturais falham ao unir novamente as narrativas histórico-evolucionárias de natureza-cultura-teoria. Lévi-Strauss reduz o que define como nível retórico superficial da história fenomenal ao que ele define como o nível lógico profundo da psicologia estrutural; Foucault reduz o que ele define como o nível retórico superficial da história fenomenal ao que ele define como o nível gramatical médio da epistemologia funcional; Derrida reduz o que ele define como nível retórico superficial da história fenomenal e nível lógico profundo da psicologia estrutural à oposição binária que se desconstrói a si mesma. Dessa forma Lévi-Strauss, Foucault, Derrida reduzem as narrativas histórico-evolucionárias da história cultural a, respectivamente, um sistema de troca espacializado, a-histórico, lógico-estrutural; sistema de troca gramático-funcional, um sistema de troca retórico-fenomenal.

Nesse contexto sugiro três passos que nos permitirão unir novamente as narrativas histórico-evolucionárias e as culturais: 1.) Podemos descentralizar a linguagem ao reconhecer que enquanto um primoroso modo expressivo de troca, enquanto meio de pensamento, fala, escrita, enquanto meio dessa mesma frase, a linguagem é, entretanto, só mais uma articulação de uma longa história evolucionária das relações significativas de troca. 2.) Podemos mudar o foco da teoria cultural da virada linguística do século XX para a reflexividade histórico-evolucionária do século XXI. 3.) Podemos escrever uma teoria pós-milenista reflexiva, crítica da longa história evolucionária de relações significativas de troca. Ou seja, enquanto definimos e filtramos nosso conhecimento do mundo na e pela linguagem e suas categorias, nós podemos, entretanto, descentralizar a linguagem e suas categorias num contexto histórico-evolucionário mais amplo. Ao invés de universalizar a semiótica da

linguagem, podemos generalizar a semiótica natureza-cultura-história. Ao invés de refetichizar sistemas espacializados, a-históricos, lógico-estruturais, sistemas gramático-funcionais, ou sistemas de troca retórico-fenomenais, podemos escrever narrativas pós-milenistas reflexivas, críticas, narrativas histórico-evolucionárias das relações significativas de troca. Ou seja, podemos reintegrar a lógica-gramática-retórica da troca nas narrativas histórico-evolucionárias da história evolucionária.

Em suma, sugiro que podemos avançar nas teorias da natureza de Darwin, Wallace e Mendel ao modificar nossa atenção das identificações empíricas de espécie, variedades e genes para as articulações evolucionárias de relações significativas de troca. Podemos avançar nas teorias da cultura de Lévi-Strauss, Foucault, Derrida ao reposicionar nossa atenção das estruturas espacializadas dos sistemas de troca lógicos, gramaticais, retóricos para as histórias evolucionárias de relações de troca significativas. Podemos avançar nas teorias da história de Hegel, Marx e Nietzsche ao deslocar nossa atenção da mecânica dialética da mente, da matéria, da moralidade para os algoritmos de relações de troca significativas. Por sua vez, sugiro que podemos avançar nas teorias de complexidade atuais ao deslocar nossa atenção da emergência da complexidade fenômeno-estrutural para a evolução da reflexividade histórico-evolucionária. Voltaremos a essas teorias de natureza-cultura-história e reflexividade ao longo desse estudo.

Ao invés da teoria de tudo, portanto, proponho uma teoria de nada. Especificamente, sugiro que as relações significativas de troca voltam a si mesmas repetidamente ao longo dos anos e que desenvolvem os algoritmos evolucionários de troca que, por sua vez, voltam a si mesmos repetidamente ao longo dos anos e desenvolvem eco-matrizes de troca que, por sua vez, voltam a si mesmas repetidamente ao longo dos anos e desenvolvem, por exemplo, a nossa chamada espécie. Por sua vez, nos objetivamos as eco-matrizes de troca coincidentais de tipo micro-médio-macro e as chamamos de natureza-cultura-história. E nesse contexto uma nova teoria geral da evolução leva a uma nova teoria geral da história evolucionária. A troca de genes, a troca de bens, a troca de cumprimentos, por exemplo, já são articulações tardias de natureza-cultura-história. E então ao invés de reduzir o universo a uma estática tabula formal de coisas empíricas objetificadas, podemos reconhecer o universo como uma eco-matriz coincidental – ou, melhor, como uma vasta rede interativa de eco-matrizes coincidentais do tipo micro-médio-macro- de relações significativas de troca. E com esse mesmo argumento a longa história evolucionária dessas eco-matrizes coincidentais volta a si mesma na e através de nossa chamada espécie e desenvolve a consciência reflexiva da história evolucionária.

Nesse contexto sugiro que cada coisa que evolua da longa história evolucionária das relações significativas de troca seja, bem, relativa. Ou seja, nada existe em si e de si. E nada existe em si e de si porque nada possui uma origem pura, essência pura, identidade pura. E nada possui uma origem pura, essência pura e identidade pura porque tudo evolui de interseções—caminhos – redes de relações significativas de troca particulares energético-materiais e material-energéticas, temporal-espaciais e espacial-temporais. Podemos definir uma assim chamada árvore como um objeto ou uma coisa, por exemplo, somente se ignorarmos completamente o fato de o que tentamos consertar e nomear como uma árvore é na realidade a coincidência histórico-evolucionária de inúmeras relações significativas de terra, ar, fogo, água interagindo num particular tempo eco-histórico e lugar eco-geográfico. E podemos definir uma assim chamada árvore se ignorarmos o fato de que a mesma palavra "árvore" é na realidade a co-incidência histórico-evolucionária de inúmeras relações significativas de sons, pausas, letras, sinais interagindo num tempo sócio-histórico particular e num lugar sociolinguístico. E podemos definir uma assim chamada árvore como um objeto ou coisa somente se ignorarmos completamente o fato de que o que chamamos de consciência, percepção, identidade, perspectiva do que chamamos de sujeito que vê o que chamamos de objeto da assim chamada árvore são também as coincidências histórico-evolucionárias de inúmeras relações significativas de significantes interagindo num tempo histórico-cultural específico

e lugar cognitivo-cultural. E nós podemos definir uma assim chamada árvore como um objeto ou coisa somente se ignorarmos completamente o fato de que estamos trocando significantes daqui para aqui e de agora para agora ao longo do caminho sintático temporal-espacial e espacial-temporal dessa frase específica que também conecta o aqui-lá-todo lugar assim como passado-presente-futuro dos lugares e tempos onde e quando essa frase está sendo escrita e os lugares e tempo onde e quando será lida. E assim, como Whitman abordando as gerações futuras, "Crossing Brooklyn Ferry", estou abordando as gerações futuras ao pegar a balsa sintática dessa mesma frase. Saudações companheiros viajantes! Nós somos os seres do tempo! Por enquanto, o tempo sendo agora, o tempo sendo viver e morrer: dar e receber, perder e manter – uma sintaxe desvendando as narrativas do tempo. Em outras palavras, Heidegger entendeu tudo errado: não é o ser e o tempo, é o ser do tempo. E como ser do tempo podemos estudar o ser do tempo no espelho hermenêutico da história evolucionária.

Um quadro pós-milenista da assim chamada árvore em pé sozinha no prado, portanto, pode ser uma abstração neo-pontilhista que nos lembra das interações coincidentais energético-materiais e temporal-espaciais das inúmeras relações significativas de troca desenvolvendo inúmeros níveis-dimensões-escalas relativos-complexos-reflexivos e velocidades de física-química-biologia, economia-sociologia-história, antropologia-psicologia-história da arte, etc., etc. E o quadro também poderia ser uma lona preta – porque podemos ter deixado passar o ônibus coincidental, porque podemos ter deixado passar as articulações energético-temporais e temporal-espaciais da eco-matriz de relações significativas de troca que definem o que nós retrospectivamente chamamos de universo, natureza, árvore; o eu, consciência, percepção; sujeito, verbo, objeto; frase, palavra, significante; ponto, ponto, ponto e ponto e depois nada a não ser o espaço branco...Ou seja, o pintor poderia estar de pé em um prado vazio onde um magnífico carvalho um dia esteve e onde o carvalho magnífico poderá estar. E assim o pintor pode estar de pé em um espaço branco vazio de um presente onde as eco-matrizes coincidentais energético-materiais e temporal-espaciais de relações significativas de troca que desenvolvam o que chamamos de carvalho magnífico não-mais-e-não-ainda exista. Nesse contexto podemos explorar as radicais implicações histórico-evolucionárias do radical pensamento histórico-evolucionário da origem que não possui originalidade, da espécie que não possui especificidade, da essência que não possui essencialidade. Podemos explorar as implicações histórico-evolucionárias radicais da condição do nada do nada.

E assim deve ficar claro que a história evolucionária da condição do nada do nada não é o mesmo que a fenomenologia existencial do nada, porque, como rei Lear diz em resposta ao Bobo, "Nada vem do nada!" Ao invés da história evolucionária da condição do nada do nada, a história evolucionária das relações significativas de troca coincidentais, algoritmos evolucionários de troca, eco-matrizes de troca. Dessa forma deslocamos a atenção da ciência iluminista das redes espacializadas das coisas empíricas para as histórias evolucionárias das relações significativas. É claro, não importa quantas vezes façamos a distinção entre condição do nada do nada e inexistência do nada, o argumento será, sem sombras de dúvida, reinterpretado em alguns lugares como mais uma versão pós-moderna da fenomenologia existencialista. E mesmo assim em contraste com a fenomenologia Heideggeriana da emergência do ser – e em contraste com todas as outras teorias natural-científicas, social-científicas e humanísticas da lógica estrutural essencial, da gramática formal funcional, da fenomenal retórica aparente do assim chamado universo – proponho uma teoria histórico-evolucionária da surpreendentemente intricadas relações significativas de troca que conectam tudo como nada. E já que essa teoria pós-milenial revela como tudo é nada, ela então revela como tudo é intricadamente conectado a tudo o mais em eco-matrizes do tipo micro-médio-macro de relações significativas de troca coincidentais locais-globais-universais. Em vez de delinear uma teoria reducionista, econômica, neoclássica da lógica racional sistêmica da significação ou uma teoria redutora, textual e pós-moderna da desconstrução a-histórica sem fim da

significação, estou delineando uma teoria reflexiva, crítica e pós-milenista da longa história evolucionária das relações significativas de troca.

Como resultado, estamos indo diretamente contra os próprios limites da linguagem anglo-saxônica analiticamente inclinada. E assim podemos nos lembrar de que existem outras línguas que permitem que outras culturas entendam e representem a si mesmas e ao assim chamado universo de maneiras diferentes. A língua Navajo, por exemplo, articula todos os tipos de distinções nominativas que dão sentido ao mundo e, ainda assim, a frase Navajo é dominada pelo sintagma verbal. Em *The Navajo Language* (1942), Young e Morgan explicam: "O verbo navajo, diferentemente do inglês, frequentemente contém em sua estrutura não apenas a ideia verbal, mas também os pronomes do sujeito e do objeto, e muitos modificadores adverbiais. É, em si, uma frase completa "(NL, 41). De fato, mesmo muitos dos chamados substantivos Navajo têm sua origem em frases verbais. Em *A Vocabulary of Colloquial Navajo* (1951), Young e Morgan explicam que a palavra Navajo para irmão ou irmã, por exemplo, significa literalmente: "Eu saí com ele / ela" (VCN, 37). A palavra Navajo para o clã do pai significa literalmente: "Eu sou nascido para isso", enquanto a palavra Navajo para o clã da mãe significa literalmente: "Eu nasci para ele" (VCN, 98). Como Young e Morgan observam, "os membros de um clã se consideram aparentados como membros de uma família extensa ... apesar de, na avaliação do homem branco, eles não serem realmente parentes" (VCN, 255). Além disso, o nome do clã de uma pessoa não apenas evoca suas relações com uma família extensa, mas também com uma ecologia prolongada: por ex. "a água-flui - pessoas juntas", "a linha-de-salgueiros-estendida – pessoas cinzas", "as duas-pedras – pessoas sentam", etc. (VCN, 443-45).

Infelizmente, Young e Morgan reduzem a fluidez sintética da gramática e do vocabulário dos navajos à rigidez analítica da gramática e do vocabulário anglo-saxônicos - exceto quando ocasionalmente oferecem o que chamam de traduções um tanto condescendentes e literais. Eles insistem em citar e traduzir a forma infinitiva do sintagma verbal Navajo, por exemplo, quando claramente o particípio seria muito mais evocativamente exato. Apesar de reconhecerem como é difícil traduzir de uma sensibilidade cultural para outra sensibilidade cultural, o enquadramento analítico de seus livros didáticos anglo-saxônicos, no entanto, oferece apenas alguns vislumbres da sensibilidade sintética do Navajo. Da mesma forma, as traduções anglo-saxônicas das narrativas Navajo impõem a mesma rede analítica do sujeito-verbo-objeto no fluxo sintético do sintagma verbal - eliminando assim a distintiva sensibilidade Navajo do cosmos interconectado, interrelacional e interdinâmico. Em outras palavras, as boas intenções dos etnógrafos, gramáticos, tradutores às vezes levam aos tristes resultados da apropriação cultural. Esperançosamente, novas etnografias sintéticas, gramáticas, traduções - escritas pelo próprio povo Navajo - podem oferecer novas maneiras de evocar a sensibilidade sintética do Navajo. O ponto é que a linguagem Navajo permite que o povo Navajo evoque as interconexões das relações significativas de troca de formas que não estão inteiramente disponíveis no idioma inglês.

A língua Navajo nos ajuda a reconhecer, por exemplo, que ao invés de ser deslumbrado pelo assim chamado milagre das exata relações numéricas das exatas relações de troca de energia e matéria, tempo e espaço desse universo particular que são necessários para a mesma possibilidade da evolução de vida na terra, de fato evolução de vida na terra articula as exatas relações numéricas das exatas relações de troca de energia e matéria, tempo e espaço desse universo particular. Ou seja, as relações significativas de troca específicas que desenvolveram algoritmos evolucionários de troca específicos que desenvolveram eco-matrizes de troca específicas que desenvolveram articulações metabólicas de troca específicas – ou o que chamamos de vida – são parte e parcela de uma longa história evolucionária de relações significativas de troca que desenvolvem e continuam a desenvolver, esse universo particular. Por sua vez, a assim chamada nossa espécie específica é ainda outra articulação histórico-evolucionária das mesmas relações significativas de troca – que estão se tornando reflexivamente conscientes de si em nós e através de nós. E é precisamente por isso que nossos algoritmos matemáticos correspondem aos algoritmos

matemáticos do universo. Por quê? Porque, como os Navajos diriam, nascemos para esse universo. Somos articulações reflexivas dele.

Em outras palavras, não temos que evocar as secreções da glândula pineal cartesiana, as sensações da consciência fenomenológica de Heidegger para conectar mente e corpo, ideia e fato, ciência e natureza. Ao invés, podemos notar que a longa história evolucionária de relações significativas de troca se volta a si mesma repetidamente ao longo dos anos e pulsa os algoritmos evolucionários de vida-mente-linguagem para frente. Ou seja, cada chamada espécie – a nossa inclusive – evolui de relações significativas de troca desse universo particular e cada chamada espécie – a nossa inclusive – desenvolve essas relações de troca ainda mais. E se nós somos relações significativas de troca tornadas reflexivamente conscientes, então não deve ser surpreendente descobrir que nossos algoritmos matemáticos de troca correspondem aos algoritmos matemáticos de troca do universo. E então ao invés de ficarmos aprisionados em nossa língua anglo-saxã analítica, sugiro que nos voltemos à sintética língua Navajo – mais especificamente, seus fluídicos sintagmas participiais. Ao invés de definir o universo como uma coisa objetivada, por exemplo, sugiro definir o universo como uma energia-matéria-trocando-tempo-espaço-de-nada. Nesse contexto podemos reconhecer que energia é matéria temporalizada e matéria é energia espacializada. Podemos reconhecer a plástica fluidez das relações significativas de troca. E podemos reconhecer o nome do nosso clã: nós somos o povo energia-matéria-trocando-tempo-espaço-desenvolvendo-a condição nada-do nada.

E assim sugiro, mais uma vez, que a natureza comece com a dinâmica da troca; cultura, com a prática da troca; historia, com a sintaxe da troca. Natureza comece com a dinâmica troca de energia e matéria; cultura, com a prática troca de significantes e significados; história, com a sintática troca de tempo e espaço. E mesmo assim se levanta uma questão: Como, exatamente, se desenvolvem as relações de troca? Sugiro que algoritmos de multiplicação e variação inovativos-gerativos voltam a si mesmos e desenvolvem os algoritmos de seleção e adaptação conservadores- restritivos. Em outras palavras, as mais bem sucedidas relações significativas de troca são repetidas mais regularmente, as menos bem sucedidas relações significativas de troca são repetidas menos regularmente. Sucesso, nesse contexto, refere-se ao valor relativo das articulações ecológicas de troca mais favoráveis. Como resultado, as relações significativas de troca mais bem sucedidas desenvolvem os critérios de seleção de troca e os critérios de seleção de troca desenvolvem as mais bem sucedidas relações significativas de troca. Elas são modificadas-selecionadas-adaptadas repetidamente ao longo dos anos conforme continuam a desenvolver novos algoritmos de troca.

Em suma, como as relações significativas de troca mais bem sucedidas se voltam a si mesmas repetidamente, elas desenvolvem novos algoritmos relativos que desenvolvem novos algoritmos complexos que desenvolvem novos algoritmos reflexivos. Por sua vez, esses novos algoritmos relativos-complexos-reflexivos de relações significativas de troca voltam a si mesmos e desenvolvem novos níveis-dimensões-escalas e velocidades de troca. Dessa forma as relativamente menos complexas eco-matrizes coincidentais do tipo micro-médio-macro de energia-matéria-trocando-tempo-espaço-desenvolvendo-a condição do nada-do nada às vezes desenvolve eco-matrizes coincidentais do tipo micro-médio-macro relativamente mais complexas. Os algoritmos relativos de energia e matéria, por exemplo, desenvolvem algoritmos complexos de estrelas e planetas. Entretanto, é somente quando os algoritmos relativamente complexos de troca desenvolvem algoritmos relativamente complexos de troca que o metabolismo de troca – isto é, vida – evolui. Nesse contexto sugiro que assim como as hierarquias de dominância da lógica-gramática-retórica da troca definiram as teorias dominantes de natureza-cultura-história, então também definiram as teorias dominantes de relatividade-complexidade-reflexividade.

No seu livro, *At Home in the Universe* (1995) Kauffman observa que "A maioria dos meus colegas acreditam que a vida emerge simples e se torna complexa. Eles imaginam moléculas de RNA

simples replicando e replicando e eventualmente se encontrando e construindo todo o maquinário químico complicado que encontramos em uma célula viva. A maioria dos meus colegas também acredita que a vida é totalmente dependente da lógica molecular de replicação de modelos, o pareamento A-T, G-C Watson-Crick..." Kauffman continua, "Tenho uma visão renegada: a vida não está algemada à mágica da replicação de modelos, mas baseada em uma lógica mais profunda. Espero persuadi-los de que a vida é uma propriedade natural de sistemas químicos complexos, que quando o número de diferentes tipos de moléculas em uma sopa química ultrapassa certo limiar, uma rede de reações autossustentáveis - um metabolismo autocatalítico - surgirá de repente. A vida surgiu, eu sugiro, não simples, mas complexa e completa, e permaneceu complexa e completa desde sempre ... "(AHU, 478) Podemos traduzir os termos de certa forma confusos de Kauffman nos termos mais claros de nossa teoria histórico-evolucionária da lógica-retórica-gramática das relações significativas de troca.

De fato, Kauffman argumenta que a maioria dos biólogos acredita que a retórica de superfície da emergência fenomenal da vida pode ser reduzida à gramática mediana do modelo funcional de DNA. No entanto, ele quer levar esse argumento padrão além. Sugere que a gramática mediana do modelo funcional de DNA pode ser mais reduzida à lógica profunda das interações estruturais dos químicos. De fato, ele argumenta que a retórica fenomenal da vida emerge diretamente da lógica estrutural dos químicos. Ou seja, ele explicitamente rejeita o papel mediador da gramática funcional da genética: "Acredito que a vida, em sua raiz, não depende da mágica do pareamento Watson-Crick ou de qualquer outro maquinário específico de replicação de modelos" (AHU, 50). Kauffman, tal como Derrida, explicitamente rejeita o papel mediador da gramática funcional. Enquanto Derrida desconstrói as oposições binárias de retórica fenomenal e lógica estrutural, Kauffman reconstrói suas relações operacionais. Ele sugere que a vida emerge "completa" de uma "fase de transição" dos químicos interativos relativamente menos complexos para os químicos interativos relativamente mais complexos (AHU, 48). Em outras palavras, ele sugere que a retórica fenomenal da vida emerge diretamente da lógica estrutural de sistemas químicos interativos auto-organizados, autocatalíticos. E é precisamente o porquê de Kauffman ter de evocar um pouco de sua própria magia de palco. Ele precisa evocar a metáfora mágica de "fase de transição". Por quê? Precisamente porque essa metáfora mágica o permite saltar da lógica estrutural profunda dos químicos para a retórica de superfície fenomenal da vida. Em contraste, sugiro que podemos, novamente, re-historicizar e ressintetizar a lógica-gramática-retórica dos níveis estruturais-funcionais-fenomenais de análise científica empírica. Ao invés da mágica súbita da fase de transição, é a longa história evolucionária das relações significativas de troca que conecta esses aparentemente diferentes níveis de análise. Sugiro, por exemplo, que a lógica da troca – o que Kauffman chama de interações química – desenvolve a gramática da troca – o que Kauffman chama de modelo genético – que desenvolve a retórica da troca – o que Kauffman chama de autocatálise metabólica. E é claro, por sua vez, a retórica metabólica da troca desenvolva a gramática genética da troca que desenvolva a lógica química da troca. Em outras palavras, esses aparentemente níveis-dimensões-escalas diferentes e velocidades de troca voltam a si mesmos repetidamente ao longo dos anos e desenvolvem eco-matrizes de troca coincidentais do tipo micro-médio-macro. Assim não precisamos evocar a mágica repentina das fases de transição, a mágica repentina da consciência fenomenal, a mágica repentina de propriedades emergentes para saltar de um nível espacializado de análise a outro. Ao invés, podemos traçar a longa história evolucionária de relações significativas de troca que conectam os algoritmos de troca relativos-complexos-reflexivos.

Ao invés de conjurar a mágica fenomenal de propriedades emergentes da ciência estrutural de sistemas complexos – penso aqui nos trabalhos de Gell-Mann, (QJ, 1994), Kauffman (AHU, 1995), Lewin (C, 1992) e seus herdeiros no Santa Fe Institute – sugiro que podemos esboçar a longa história evolucionária de algoritmos de troca relativos-complexos-reflexivos. Podemos identificar as sequencias algorítmicas passo

a passo que conectam a lógica-gramática-retórica das relações significativas de troca estruturais-funcionais-fenomenais. Podemos reconhecer como essas sequencias algorítmicas voltam a si mesmas e desenvolvem a retórica-gramática-lógica das relações significativas de troca fenomenais-funcionais-estruturais. E assim podemos identificar os vários meios nos quais algumas das eco-matrizes de relações significativas de troca coincidentais do tipo micro-médio-macro menos complexamente reflexivas desenvolvem algumas das eco-matrizes de relações significativas de troca coincidentais do tipo micro-médio-macro mais complexamente reflexivas. É claro isso não significa que a história evolucionária está sempre progredindo no sentido de níveis mais e mais elevados de relatividade-complexidade- reflexividade. E é claro isso não significa que a história evolucionária está sempre progredindo no ritmo lento da tartaruga. De fato, a história evolucionária às vezes prossegue no ritmo acelerado da lebre – mas não temos que retirar o coelho do chapéu para explicar o ritmo acelerado. Ao invés, podemos traçar a longa história evolucionária de relações significativas de troca que se voltam a si mesmas repetidamente ao longo dos anos e desenvolvem inúmeras variedades de algoritmos relativos-complexos-reflexivos.

Ao invés de uma teoria fenomenal-estrutural da emergência da complexidade, proponho, portanto, uma teoria histórico-evolucionária da evolução da relatividade-complexidade-reflexividade. Ou seja, temos que argumentar que a complexidade "emerge" magicamente de um "sistema adaptativo" somente quando congelamos e enquadramos as relações significativas de troca nas redes espacializadas da ciência empírica iluminista. Ao invés, sugiro que podemos recontextualizar a evolução da complexidade dentro da longa história evolucionária dos algoritmos de troca relativos-complexos-reflexivos. Se a história evolucionária desse universo é uma narrativa, de quase quatorze bilhões de anos, de energia e entropia, ordem e caos, vida e morte, então como vamos de relações significativas de troca de quantum menos complexamente reflexivas para relações significativas de troca genética mais complexamente reflexivas? A metáfora extensa da assim chamada fase de transição da assim chamada emergência da complexidade – isto é, o salto fenomenal de um nível espacializado de análise a outro – na realidade salta por cima da questão das conexões histórico-evolucionárias que conectam as eco-matrizes de relações significativas de troca coincidentais do tipo micro-médio-macro menos complexamente reflexivas às eco-matrizes de relações significativas de troca coincidentais do tipo micro-médio-macro mais complexamente reflexivas. Essa metáfora extensa dá a impressão de ser a dinâmica evolucionária, bem, mágica e mística. Ao invés, sugiro que é histórica e algorítmica. Sugiro que é a longa história evolucionária dos algoritmos de troca que desenvolvem e conectam as eco-matrizes de relações significativas de troca coincidentais do tipo micro-médio-macro menos complexamente reflexivas às eco-matrizes de relações significativas de troca coincidentais do tipo micro-médio-macro mais complexamente reflexivas. Em suma, a história evolucionária da relatividade-complexidade-reflexividade pode ser definida em termos da história evolucionária dos algoritmos de troca relativos-complexos-reflexivos. Ao invés de repetir os encantamentos mágicos de fórmulas mágicas, podemos traçar as histórias evolucionárias de algoritmos evolucionários.

Nesse universo em evolução específico, por exemplo, os novos algoritmos relativos de troca física – por exemplo, $E=mc^2$ - voltaram a si mesmos e desenvolveram novos algoritmos complexos de troca química – por exemplo, $H_2 + O$ = água – que voltaram a si mesmos e desenvolveram novos algoritmos reflexivos de troca biológica- por exemplo, DNA + DNA = células. E como esses novos algoritmos relativos-complexos-reflexivos voltaram a si mesmos eles desenvolveram o metabolismo de troca – ou aquilo que nós agora definimos como eco-matriz coincidental da vida. Por sua vez, os novos algoritmos relativos-complexos-reflexivos de trocas físicas-químicas-biológicas voltaram a si mesmos e desenvolveram os novos algoritmos relativos de troca sensória – por exemplo, estímulo + resposta = comportamento reativo – que voltaram a si mesmos e desenvolveram os novos algoritmos complexos de troca sináptica- por exemplo, Link + Link = comportamento governado – que voltaram a si mesmos e desenvolveram novos

algoritmos reflexivos de troca neural – por exemplo, caminho + caminho = comportamento recursivo. E como esses novos algoritmos relativos-complexos-reflexivos voltaram a si mesmos eles desenvolveram a consciência da troca – ou o que nós agora definimos de eco-matriz coincidental da mente. Por sua vez novamente, os novos algoritmos relativos-complexos-reflexivos de troca física-química-biológica e troca sensória-sináptica-neural voltaram a si mesmos e desenvolveram os novo algoritmos relativos da troca lógica – por exemplo, gestual + vocalização = significante – que voltaram a si mesmos e desenvolveram os novos algoritmos relativos de troca gramatical – por exemplo, significante + significante = sintaxe – que voltaram a si mesmos e desenvolveram novos algoritmos reflexivos de troca retórica – por exemplo, sintaxe + significação = semântica. E como esses novos algoritmos relativos-complexos-reflexivos de troca voltaram a si mesmos eles desenvolveram articulações de troca – ou o que nós agora podemos definir de eco-matriz coincidental da língua. E, mais provavelmente, as reflexivas trocas neurais da mente e as reflexivas trocas recursivas da língua evoluíram juntas. Similarmente, esses ciclos lógicos-gramáticais-retóricos de troca voltaram a si mesmos e desenvolveram os ciclos de troca retóricos-gramaticais- lógicos.

Em suma, os algoritmos relativos-complexos-reflexivos das trocas físicas-química-biológicas voltaram a si mesmos e desenvolveram algoritmos relativos-complexos-reflexivos de troca sensória-sináptica-neural que voltaram a si mesmos e desenvolveram os algoritmos relativos-complexos-reflexivos de troca lógica-gramatical-retórica. E mesmo assim, novamente, nós paramos no ponto crítico dos algoritmos relativos e dos algoritmos complexos de troca quando deveríamos dar mais um passo e reconhecer os algoritmos reflexivos de troca. Em contraste, sugiro que nós chegamos à vida-mente-linguagem e, em outro nível, natureza-cultura-história, somente quando os algoritmos relativos de troca e os complexos algoritmos de troca voltem a si mesmos e desenvolvam os algoritmos reflexivos de troca. E então juntamente com a nova ciência da relatividade e a nova ciência da complexidade proponho uma nova ciência da reflexividade. Os algoritmos reflexivos de troca física-química-biológica desenvolveram a eco-matriz coincidental da vida; os algoritmos reflexivos de troca sensória-sináptica-neural desenvolveram a eco-matriz coincidental da mente; os algoritmos reflexivos de troca lógica-gramatical-retórica desenvolveram a eco-matriz coincidental da língua.Em outras palavras, a singularidade da consciência humana não é tão singular, pelo contrário, é parte e parcela de uma longa história evolucionária da reflexividade. E é precisamente porque proponho uma nova ciência histórico-evolucionária da reflexividade.

Os cientistas iluministas empíricos e os filósofos românticos intuitivos não conseguiram definir vida-mente-língua ou natureza-cultura-história precisamente porque eram nada (coisa nenhuma). Enquanto o materialismo analítico da ciência empírica iluminista desbloqueou e exumou o pensamento crítico, também reificou, no entanto, as relações significativas de troca. Por quê? Por que a não identidade da não identidade é invisível ao olho e inaudível ao ouvido. E então a não identidade da não identidade é muito difícil de articular em Francês, Alemão, Inglês – as línguas analíticas dominantes do Iluminismo Europeu. Como observado, até mesmo Darwin se esquivou desse pensamento radical. E então- sem estarem conscientes do que faziam – os cientistas empíricos iluministas reificaram as eco-matrizes coincidentais de relações significativas de troca do tipo micro-médio-macro em evolução. Eles analisaram coisas reificadas em um universo objetivado porque foi o que viram e ouviram, o que tocaram, cheiraram, provaram. Como resultado, eles pararam o tempo, enquadraram o espaço, estreitaram a percepção com escada lógicas, tabulas gramaticais, fluxos retóricos da ciência natural, história natural, filosofia natural. E eles normalmente resumiam suas descobertas surpreendentes com um algoritmo, ou com um grupo de algoritmos.

E mesmo assim o que é um algoritmo, afinal, senão uma fórmula temporal de troca? O sinal de igual em cada equação grita: "Isso pode ser trocado por aquilo!" Dessa forma, um algoritmo articula os valores relativos de significantes sendo trocados assim como os valores relativos de significantes iniciando a troca. Dessa forma cientistas contemporâneos podem finalmente fazer a transição da física empírica de coisas

enquadradas objetivadas para a história evolucionária das relações significativas de troca. Dessa forma, sugiro que a dinâmica evolucionária fundamental da longa história evolucionária da natureza-cultura-história possa ser definida como repetições inovadoras-geradoras de multiplicações e variações de relações significativas de troca e repetições conservadoras-restritivas de seleções e adaptações de relações significativas de troca. Essas relações significativas de troca inovadoras-geradores e conservadoras-restritivas voltaram a si mesmas repetidamente ao longo dos anos e desenvolveram novos algoritmos de troca evolucionários que desenvolveram novas eco-matrizes de troca coincidentais. Nesse contexto sugiro que podemos redefinir o que Paps e Holland inferem como sendo "o genoma mínimo de codificação de proteínas do primeiro animal" como uma já articulação algorítmica bem tardia de uma já bastante longa história evolucionária das relações significativas de troca. Similarmente, sugiro que podemos redefinir a rede neural da mais recente matriz de inteligência artificial como uma já articulação algorítmica bem mais tardia de uma já muito mais longa história evolucionária das relações significativas de troca. Em outras palavras, ao invés de pensar como um filósofo empírico anglo-saxão, podemos pensar como um historiador evolucionário Navajo-americano. Ou seja, ao invés de nos apropriarmos da cultura Navajo, podemos ouvir ao povo Navajo.

Nesse contexto sugiro que podemos dar um passo além na teoria de Darwin-Wallace-Mendel ao reconhecer que enquanto espécie, a variedade, o gene são articulações histórico-evolucionárias das relações significativas de troca, eles não explicam essas relações significativas. Imagine se linguistas históricos argumentassem que o alfabeto explica a evolução da linguagem. Responderia que enquanto o alfabeto é uma articulação histórico-evolucionária das relações significativas de troca, não explica a evolução da linguagem. E então o foco na espécie, na variedade, no gene revela o viés redutivo, analítico, materialista dos cientistas iluministas que reduziram o todo reificado à parte reificada - e então não conseguiram juntar Humpty e Dumpty novamente. Por que esse viés? Porque no intuito de se libertarem das especulações espirituais da teologia escolástica, os cientistas iluministas precisaram se fundamentar nas análises materiais da ciência empírica. Precisaram se fundamentar no mundo material que vivenciavam com os cinco sentidos. E, como já observei, eles fizeram descobertas tremendas. Similarmente, os cientistas empíricos que continuaram a perseguir essas análises empíricas até hoje continuam a fazer descobertas tremendas. No entanto, como também já observei, os novos cientistas iluministas pagaram um alto preço pelas suas investigações objetivas, experimentais, analíticas. Eles reduziram a ciência à busca pela origem material das coisas empíricas ao invés de reimaginar a ciência como uma reflexão da longa história evolucionária das relações significativas de troca. E então não é coincidência que a busca do novo explorador iluminista pelo Nilo e pelo Amazonas, as origens dos polos norte e sul, as origens da espécie e do homem, etc., etc., coincidiram com a busca do novo cientista iluminista pela origem material das coisas empíricas. E já que a maioria dos cientistas são homens e já que a maioria dos homens são notoriamente ruins em reconhecer a importância crítica de relações significativas, então temos o viés histórico reacionário, o viés epistemológico reacionário e o viés reacionário de gênero da ciência empírica das coisas. Não é de se admirar, portanto, que os filósofos e poetas românticos tenham tentado reatar a natureza com suas evocações intuitivas do sublime transcendental. E não é de se admirar que Heidegger tenha tentado reatar a natureza com suas meditações fenomenológicas sobre a emergência do ser. E não é de se admirar que tenham falhado.

Em outras palavras, sugiro que ao invés de enquadrar e universalizar o mundo iluminista dos fatos empíricos duros, ou o mundo romântico das suaves visões transcendentais, ou o mundo pós-moderno das simulações plásticas desconstrutivas, podemos rehistoricizar e criticar o mundo pós-milenista de relações significativas de troca. Nesse contexto sugiro que as relações significativas de troca conectam a natureza da natureza, a natureza da cultura, a natureza da história numa narrativa histórico-evolucionária contínua ou, melhor, numa série contínua de narrativas histórico-evolucionárias locais-globais-

universais que não são nem coordenadas no espaço, nem sincronizadas no tempo. Ou seja, a história evolucionária não evolui da mesma forma em todos os lugares, ao mesmo tempo, nos mesmos estágios. Como Einstein sugeriu, espaço-tempo é relativo. A vida evoluiu aqui na terra, por exemplo, ao longo de três bilhões de anos, mas não sabemos onde mais ou quando mais pode ter também evoluído. Similarmente, uma cultura e uma geração articulam algumas eco-matrizes de relações significativas de troca e outra cultura e outra geração articulam outras eco-matrizes. E apesar de algumas dessas culturas, gerações, eco-matrizes se sobreporem, entretanto, isso não garante que elas sejam coordenadas no espaço ou sincronizadas no tempo. Como resultado, conflitos e contradições tremendas emergem das práticas competitivas e cooperativas de troca-significação-valor. E é precisamente porque a história evolucionária não pode só ser analítica, empírica, descritiva, mas deve ser também sintética, crítica, reflexiva. Os conflitos e contradições da cultura não são somente naturais e inevitáveis, mas também culturais e históricos. Marx estava catastroficamente errado sobre muitas coisas, mas estava exatamente certo quando disse, "Os homens fazem sua própria história, mas não a fazem como bem entendem; eles não o fazem sob circunstâncias de suas próprias escolhas..." (EB, 9). E então devemos criticar reflexivamente as várias formas nas quais homens e mulheres fazem suas histórias – as várias formas nas quais nos incorporamos, atuamos, desenvolvemos a dinâmica-prática-sintaxe da troca.

Assim como as teorias da origem da origem da natureza confundem as articulações da história evolucionária com a dinâmica da história evolucionária, assim também as teorias da origem da cultura confundem as articulações da história evolucionária com as práticas da história evolucionária. Confundem as articulações com as explicações. Como sugeri, a longa história evolucionária das relações significativas de troca desenvolveram os chamados gênero e espécie *Homo sapiens* e depois, por sua vez, os chamados gênero e espécie *Homo sapiens* desenvolveram a longa história evolucionária das relações significativas de troca. Ou seja, as relações significativas de troca desenvolveram os algoritmos evolucionários de troca que desenvolveram as eco-matrizes coincidentais dos seres humanos modernos e da cultura humana moderna.

Homo sapiens, como uma espécie moderna com uma cultura moderna, então, não somente apareceu com a mudança do clima; um desbaste da floresta; uma descida as árvores; um par de pernas mais longo, uma marcha bipedal; uma postura ereta; um par de braços e mãos mais livres; um estômago mais estreito; uma mandíbula mais curta; um conjunto menor de dentes; um rosto mais plano; uma orelha média óssea; um cérebro fissurado maior; uma matriz sináptica; uma família de forrageamento-necrofágico; um domínio de ferramentas; um controle de fogo; uma colheita de frutos do mar; uma facilidade com armas de projétil; um bando de caça e coleta; uma dieta rica em proteínas; uma mutação genética; uma reorganização neural; uma consciência cognitiva; uma adaptabilidade comportamental; uma fluência linguística; uma criatividade inovadora; uma divisão do trabalho; um aumento na população; uma demografia mais densa; uma tribo aguerrida; um sistema imunológico mais eficiente; uma capacidade coletiva de imitar, aprender, adaptar-se; uma memória melhorada; um clã totêmico; uma proibição de incesto; uma exigência de exogamia; um sistema de linhagem; um altruísmo de parentesco; um altruísmo recíproco; uma lógica estrutural; uma gramática funcional; uma retórica fenomenal; uma bio-lógica genética; uma psico-gramática modular; uma socio-retórica memética; uma capacidade de pensar, planejar, imaginar; uma proficiência com narrativas míticas, religiosas e dramáticas; uma prontidão para abstração, representação, simbolização; um talento para pintura, música, arte; um assentamento de criação de gado; uma aldeia de comércio; uma cidade de festivais de mercado; uma cidade comercial-manufatureira; uma canalização de fluxos de energia; uma complexidade crescente; um acúmulo e leitura de informações, etc., etc. Klein cita muitas dessas teorias da origem da cultura e eu adiciono muitas outras de diferentes áreas de estudo. Apesar de cada uma dessas teorias evocar um diferente fator da história evolucionária, nenhuma delas realmente explica a dinâmica-prática-sintaxe da

história evolucionária.

Em contraste, sugiro que Homo sapiens enquanto uma espécie moderna com uma cultura moderna evoluiu através de uma longa história evolucionária de vantagens cumulativas de proporções específicas – o que chamamos de proporções Quixt – de repetições inovadoras-geradoras e repetições conservadoras-restritivas de sucessos mutuamente reforçadores dos algoritmos relativos-complexos-reflexivos de relações significativas de troca. Esses algoritmos evolucionários selecionados pela relatividade sinergética de indivíduos sociais com habilidades sociais; eles selecionados pela complexidade sinérgica de indivíduos sociais com cérebros sociais; selecionados pela reflexividade sinérgica de indivíduos sociais com mentes sociais – e então eles desenvolveram as eco-matrizes coincidentais relativas-complexas-reflexivas dos seres humanos modernos e culturas humanas modernas. Nesse contexto podemos retornar ao nosso argumento inicial e relembrar nossa definição de vida como uma eco-matriz coincidental relativa-complexa-reflexiva da dinâmica metabólica de troca; nossa definição de mente como uma eco-matriz coincidental relativa-complexa-reflexiva da dinâmica neural de troca; nossa definição de língua como uma eco-matriz coincidental relativa-complexa-reflexiva da dinâmica recursiva da troca. O filósofo empírico intransigente, que argumenta que a consciência em si e de si não existe, deveria argumentar, se fosse consistente, que vida-mente-língua em si e por si não existe. É claro que vida-mente-língua não existe em si e de si mesma como coisas objetificadas empíricas, precisamente porque são mais articulações da longa história evolucionária das relações significativas de troca relativas-complexo-reflexivas. As relações significativas da vida-mente-língua desenvolveram vários grupos sociais e vários grupos sociais desenvolveram as relações significativas da vida-mente-língua. E é claro que esses grupos sociais ofereceram enormes vantagens adaptativas sobre a vida isolada de indivíduos isolados.

Klein afirma que, "Se nós aceitamos que o comportamento do humano moderno forneceu a vantagem competitiva que possibilitou os humanos modernos se dispersaram a partir da África, permanece incerto o que promoveu o progresso comportamental. Foi consequente estritamente das mudanças sociais, econômicas ou tecnológicas, como a maioria dos especialistas acredita, ou foi desencadeada por uma mudança neurológica que promoveu a capacidade cognitiva totalmente moderna? "(HC, 721-2). No entanto, ao invés de escolher entre alternativas de mudança social-econômica-tecnológica ou genética-neural-psicológica como a explicação para a origem da cultura, sugiro que as relações significativas de troca desenvolveram os algoritmos de troca que desenvolveram as proporções Quixt de troca que desenvolveram as eco-matrizes sustentáveis, coincidentais, do tipo micro-médio-macro que nós objetivamos como natureza-cultura-história. Desenvolveram, por exemplo, novas relações significativas de energia e matéria, tempo e espaço, estrelas e planetas, terra e ar, fogo e água. Desenvolveram vida-mente-língua. Desenvolveram família-bandos-tribos; vilas- municípios-cidades; reinos-nações-Estados. Desenvolveram obrigações-ética-regras; direitos-deveres-leis, rituais-tradições-instituições. Desenvolveram mitos-épicas-dramas, religiões-políticas-filosofias, ciências naturais - ciências sociais - humanidades. Desenvolveram histórias evolucionárias. Desenvolveram frase após frase, incluindo essas frases nesse mesmo texto e incluindo essa mesma frase. E então, sim, esse mesmo estudo é nada mais e nada menos que outra articulação de uma longa história evolucionária dos algoritmos relativos-complexos-reflexivos das relações significativas de troca. Esse mesmo estudo é nada mais que a eco-matriz coincidental das relações significativas de troca.

É claro, as articulações histórico-evolucionárias das relações significativas de troca evoluíram mais vagarosamente ou mais rapidamente dependendo de mudanças menores ou maiores, vagarosas ou rápidas nos critérios de seleção que evoluíram, e que foram desenvolvidos pelos algoritmos evolucionários de troca. Ou seja, a velocidade histórico-evolucionária dessas inovações histórico-evolucionárias dependiam de vários catalistas de evolução, de várias proporções Quixt de evolução, etc., etc. Dependiam de por quanto tempo certas relações significativas de troca inovadoras-geradoras podiam ser repetidas e mantidas

e por quanto tempo certas relações significativas de troca conservadoras-restritivas podiam ser repetidas e mantidas. Em suma, os quatro erres – relações-repetições-razões-reflexividade- são críticos para a longa história evolucionária de eco-matrizes coincidentais de troca do tipo micro-médio-macro. E então, por exemplo, os algoritmos evolucionários de seleção natural desenvolveram os algoritmos evolucionários de seleção cultural que desenvolveram os algoritmos evolucionários de seleção histórica. Por sua vez, a evolução consequente da eco-matriz – coincidental – relativa – complexa – reflexiva – das relações – significativas – de troca – que – chamamos – consciência significa que não podemos reduzir os algoritmos evolucionários de seleção histórica aos algoritmos evolucionários de seleção cultural aos algoritmos evolucionários de seleção natural – esse é o erro científico que os darwinistas sociais, psicólogos behavioristas, sociobiólogos, etc., etc., cometem. Novamente, ao invés de buscar a origem mítica de natureza-cultura-história, sugiro que podemos traçar a longa história evolucionária das relações significativas de troca que desenvolveram os algoritmos evolucionários de troca que desenvolveram as proporções Quixt de eco-matrizes de troca sustentáveis, coincidentais, do tipo micro-médio-macro.

Nesse contexto as novas possibilidades reflexivas de representação simbólica, expressão linguística, sofisticação tecnológica desenvolveram com, na e através da nossa chamada espécie. O gargalo genético da nossa assim chamada espécie que aconteceu há aproximadamente 70.000 a 60.000 anos atrás – causado possivelmente por uma seca prolongada – foi também um gargalo cultural. Ou seja, as poucas dezenas de milhares de casais férteis do *Homo sapiens* que sobreviveram ao gargalo genético podem ter sobrevivido precisamente porque já estavam em processo de desenvolver as relações significativas de troca que já estavam em processo de desenvolver os algoritmos evolucionários de trocas que já estavam em processo de desenvolver as eco-matrizes de troca coincidentais que chamamos de cultura. Em vez de desenvolver os dentes maiores do tigre-de-dente-de-sabre, nossos ancestrais desenvolveram os eco-matrizes coincidentais sustentáveis de famílias de forrageamento-necrofágico, bandos de caça e coleta e tribos aguerridas. Por sua vez, eles desenvolveram as eco-matrizes coincidentais sustentáveis dos assentamentos de criação de gado, aldeias de reunião comercial, cidades de festivais de mercado, cidades comerciais de manufatura, etc., etc.

De fato, sugiro que diferentes espécies evoluíram como diferentes expressões de uma maximização-otimização-articulação de diferentes grupos de algoritmos genéticos de troca: por exemplo, a cor das algas; as pernas da formiga; as asas da águia, a cauda do pavão, os olhos da coruja, as orelhas da raposa, os dentes do tigre, o pescoço da girafa, o tronco do elefante, as mãos do chimpanzé - e o cérebro do humano. Essas variadas formas de maximização - otimização - articulação genéticas não podem ser explicadas apenas pela seleção natural e sexual. Neste contexto, podemos perguntar, por exemplo, por que girafas? Nem a teoria da seleção natural, nem a teoria da seleção sexual oferecem qualquer explicação positiva sobre o porquê das girafas existirem. E, no entanto, sugiro que uma teoria da exuberância algorítmica das relações significativas de troca explica que as girafas existem porque, como outras espécies, elas maximizam-otimizam-atualizam determinados conjuntos de algoritmos genéticos particulares. Em outras palavras, a natureza coloca sempre a mesma pergunta: E se maximizarmos- otimizarmos - atualizarmos o conjunto de algoritmos genéticos para, respectivamente, cor, pernas, asas, rabos, olhos, orelhas, dentes, pescoços, troncos, mãos - e cérebros?

Tanto Aristóteles quanto Darwin perceberam a exuberância algorítmica da natureza quando defenderam o impulso teleológico no sentido da perfeição da forma, mas seus argumentos teleológicos, como argumentos teleológicos, revelam que suas respectivas histórias naturais muito deviam ao mito sobrenatural de Platão. Ambos sugeriram que as formas gramaticais imperfeitas do mundo natural estavam se esforçando em direção às essências lógicas perfeitas do mundo sobrenatural. Em contraste, eu não estou defendendo o impulso teleológico no sentido da perfeição da forma, ao contrário, estou defendendo a exuberância algorítmica da articulação

genética. E então apesar da morfologia do corpo do primata *Homo sapiens* se manter relativamente estável por mais ou menos 200.000 anos, isso não significa que não está mais evoluindo. Na realidade, nossos corpos e mente estão evoluindo juntos. Os benefícios da saúde nutricional e os benefícios socioeducacionais de algumas culturas, por exemplo, desenvolveram formas corporais humanas mais fortes, mais altas, maiores juntamente com formas cognitivas humanas mais letradas, numéricas, tecnológicas. E, mesmo assim, como Darwin observa em *The Descent of Man* (1871), esses tipos de distinções evolucionárias são o subproduto de processos de seleção socioeconômicos de diferentes socioecologias – e não expressão de uma suposta superioridade ou inferioridade inata de raça. Em outras palavras, as implicações radicais de uma teoria radical da evolução do nada implode o mito conservador da identidade essencial de raça – e, por conseguinte o racismo. Apesar de Darwin não perseguir as implicações radicais de sua teoria radical em *A origem das espécies*, ele volta, no entanto, a uma dessas implicações radicais – isto é, a implosão do mito conservador do racismo – com grande efeito em *The Descent of Man*. E, no entanto, após a tempestade de controvérsia pública desencadeada por suas narrativas evolucionárias amplamente concebidas, Darwin retirou-se para a paz e a quietude de seus estudos empíricos estritamente definidos. Ele escreveu uma monografia sobre emoções, sete monografias sobre plantas e animais e uma monografia final sobre o impacto ecológico das minhocas.

De qualquer forma, as descobertas arqueológicas mais recentes da antropologia evolucionária levaram à seguinte pergunta: se a morfologia moderna do *Homo sapiens* já tinha evoluído há mais ou menos 200.000 anos atrás, então por que a antropologia moderna do *Homo sapiens* apareceu há apenas 70.000 a 50.000 anos atrás? Por que demorou tanto? Sugiro que demorou cerca de 150.000 anos para que as relações significativas de troca desenvolvessem os algoritmos evolucionários de troca que desenvolveram as proporções Quixt de troca que desenvolveram as eco-matrizes coincidentais sustentáveis de troca que chamamos de cultura humana moderna. Ou seja, demorou outros 150.000 para os algoritmos relativos de troca desenvolverem os algoritmos complexos de troca e para eles desenvolverem os algoritmos reflexivos de troca. Sugiro que demorou outros 150.000 anos para os algoritmos de uma comunidade humana articulada, aculturada, reflexiva se desenvolverem.

E, novamente, com a nova expressão de relatividade - complexidade - reflexividade evolucionária, as narrativas analíticas da natureza devem necessariamente se fundir e devem necessariamente evoluir para as narrativas sintéticas de cultura e história. E, novamente, essa é a mudança crítica na consciência histórica que darwinistas sociais, cientistas behavioristas, sociobiólogos, etc., etc. não conseguem fazer. Eles reduzem a sintaxe reflexiva de troca histórica à prática complexa de troca cultural à dinâmica relativa de troca natural. Eles reduzem o comportamento recursivo ao comportamento controlado ao comportamento reativo. Eles reduzem a retórica da história à gramática da cultura à lógica da natureza: isto é, matemática, física, química; genética, cibernética, memética; cosmologia, ecologia, climatologia; biologia, demografia, neurologia; etc., etc. Obviamente a redução da retórica da história à gramática da cultura à lógica da natureza gerou muitos insights profundos. E, no entanto, sugiro que o estudo de uma comunidade humana articulada, aculturada, reflexiva requer um avanço maior. Requer a reintegração da lógica-gramática-retórica da natureza-cultura-história em narrativas histórico-evolucionárias reflexivas-críticas-pós-milenistas de relações significativas de troca.

Se as proporções Quixt de troca resvalarem demais para o âmbito de multiplicação e variação inovadoras-geradoras, por exemplo, então as práticas de troca não poderiam desenvolver uma sinergia comunitária sustentável – elas seriam muito dinamicamente instáveis. Se as proporções Quixt de troca resvalarem demais para o âmbito de seleção e adaptação conservadoras-restritivas, então as práticas de troca não poderiam desenvolver uma sinergia comunitária adaptável – elas seriam muito rigidamente estáveis. E quem sabe quantos grupos de hominídeos não conseguiram desenvolver uma sinergia comunal

flexível mas estável e estável mas flexível e acabaram desaparecendo da história? Quem sabe quantos grupos de hominídeos não conseguiram desenvolver as razões precisas de troca que levaram às vantagens adaptativas de sobrevivência cultural? As histórias perdidas dos perdidos são tão importantes para as narrativas evolucionárias da história evolucionária quanto as histórias achadas dos achados. Eles são os algoritmos evolucionários que faltam - os algoritmos evolucionários não selecionados - nos protocolos de otimização de troca.

Como Klein observa, o registro arqueológico revela que os Neandertais fizeram os mesmo martelos de pedra pesados e a mesma lâmina de pedra espessa milênios após milênios. E então sugiro que as proporções Quixt das relações significativas de troca do Neandertal resvalaram para o âmbito de seleção e adaptação conservador-restritivo e, como resultado, a evolução da cultura reflexiva do Neandertal desacelerou. Em contraste, sugiro que as proporções Quixt das relações significativas de troca do *Homo sapiens* resvalaram para o âmbito da multiplicação e variação inovadora-geradora e, como resultado, a evolução da cultura reflexiva do *Homo sapiens* acelerou. E talvez os Neandertais pudessem ter emergido do beco sem saída de suas proporções Quixt de troca conservadoras-restritivas – o problema foi a falta de tempo. Onda após onda de *Homo sapiens* seguiram os Neandertais da África para o Oriente Próximo e Europa. Reproduziram com eles, competiram com eles e talvez os tenham dizimado com algum tipo de doença pandêmica. Talvez os poucos dez milhares de casais *Homo sapiens* férteis que sobreviveram o gargalo genético de mais ou menos 70.000 anos atrás não tenham sido os únicos sobreviventes aculturados da seca prolongada, mas também os sobreviventes aculturados de algum tipo de influenza pandêmica. E talvez essa subespécie aculturada – precisamente por conta de suas proporções Quixt mais inovadoras-geradoras – foram capazes de desenvolver a solução para a seca e a resistência à doença. Talvez, por exemplo, eles tenham sido capazes de desenvolver práticas mais sustentáveis de ajuda mútua. Geralmente esquecemos que as trocas sociais de cooperação inclusiva são tão poderosas enquanto força evolucionária como as trocas sociais de competição exclusiva.

E então talvez quando uma população muito maior e muito mais inovadora-geradora de *Homo sapiens* entrou em contato com uma população muito menor e menos inovadora-geradora de Neandertais trouxeram com eles algum tipo de influenza pandêmica. Conforme sugerem Houlcroft e Underdown "A transferência de patógenos entre as populações homininéas ... também pode ter desempenhado um papel na extinção dos Neandertais ..." (AJPA, 04/10/16). E talvez os Neandertais tenham morrido devido às suas proporções Quixt muito conservadoras, aos seus sistemas imunes muito diferentes, as suas práticas de auxílio mútuo muito limitadas. Como resultado, os Neandertais apenas sobrevivem como traços em um a quatro por cento do DNA humano moderno. E, no entanto, o destino dos Neandertais nos pede para considerar o destino da nossa assim chamada espécie. As proporções Quixt da cultura contemporânea se tornaram, novamente, insustentáveis? Quebraram no meio e resvalaram para os extremos? Teriam as nossas tecnologias de troca inovadoras-geradoras se tornado muito flexíveis e instáveis? Nossas instituições de troca conservadoras-restritivas se tornado muito estáveis e inflexíveis? Em outras palavras, como sugeri, nós devemos escrever as histórias evolucionárias das relações significativas de troca em um espelho hermenêutico.

Apenas começamos a explorar as implicações radicais de nossa nova teoria geral da evolução e nossa nova teoria geral da história evolucionária. Apenas começamos a traçar a longa história evolucionária das relações significativas de troca. Apenas começamos a explicar como as relações significativas de troca desenvolvem algoritmos evolucionários de troca que desenvolvem eco-matrizes de troca. E, no entanto, deslocamos o estudo da natureza-cultura-história da busca pela teoria de tudo para a descoberta da teoria do nada.

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¿De la Big History a la Gran Historia? Conversaciones con Fred Spier

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Introducción

La Gran Historia es una perspectiva histórico-procesual que integra las escalas espacio-temporales exploradas por la historiografía de los siglos XX y XXI (corta, mediana, larga y muy larga duración) con algunos de los conocimientos más certeros de la historia natural y el proceso de formación del cosmos. Con ello, pretende alcanzar un objetivo preciso: conectar la historia humana a la historia del universo mediante una investigación transdisciplinar.

Esta perspectiva surgió en el año de 1989 en forma de un curso electivo que buscaba presentar un panorama general sobre los hallazgos de las ciencias históricas modernas. Aunque fue desarrollado como una iniciativa aislada en la Universidad de Macquarie, en Sydney, Australia por David Christian, despertó el interés en autores como Johan Goudsblom en la Universidad de Ámsterdam, Holanda.

Más tarde en 1994, Goudsblom y su discípulo Fred Spier diseñaron un curso similar en Ámsterdam con gran éxito. Para 1996, debido a los increíbles resultados del curso, a un programa de radio sobre el tema y a un número creciente de investigadores que se unieron a la agenda de investigación de la *Gran Historia,* Fred Spier tuvo el contexto propicio para la publicación de su primer libro sobre el tema, *The Structure of Big History*[1].

A partir de este entorno académico, Christian y Spier organizaron investigaciones y conferencias internacionales con astrofísicos, geólogos, biólogos y teóricos de la complejidad, buscando con ello desarrollar una estrategia para conectar la historia natural con la historia humana: metodologías comparadas e interdisciplinares nacieron a partir de aquel esfuerzo, consolidando una relato histórico en la que el trasegar de los humanos se vinculara con el trasegar de la tierra y el universo. Si bien estas perspectivas ya habían sido consideradas por la *World History*, la *Big History* pudo explorar nuevos aspectos del proceso al adoptar una escala temporal que tomara en la mira el surgimiento de las galaxias y de la vida en un mismo plano .

Desde el nacimiento de *Big History* sus miembros han trabajado sin cesar de la mano con los investigadores de *World History*. Fred Spier reconoce en su libro *El lugar del hombre en el cosmos*[2] el aporte inigualable de

1 Fred Spier, *The Structure of Big History: From the Big Bang until Today* (Amsterdam: Amsterdam Univ. Press, 1996).

2 Fred Spier, *El lugar del hombre en el cosmos: la gran historia y el futuro de la humanidad* (Barcelona: Crítica, 2011).

Carlos Daniel Pérez (Universidad Nacional) y César Duque Sánchez (Universidad del Rosario) interviewed Fred Spier, University of Amsterdam, who is the author *of La Gran Historia y el futuro de la humanidad* (*Big History and the Future of Humanity*) on February 27, 2017.

William McNeill, uno de los más destacados autores de historia mundial. Por su parte, David Christian tuvo desde la década de 1980 una fuerte cercanía con la *World History Association* (WHA), de la que aún forma parte. No obstante, *WHA* y la proliferación de *World History* como enfoque no tuvieron que ver con el nacimiento de la organización autónoma que reunía a investigadores de Big History.[3] En el año 2010, durante una pequeña reunión convocada por Walter Álvarez y Sandro Montanari, en Coldigioco, Italia, se decidió crear la *International Big History Association* debido al éxito del enfoque en el mundo.

Desde aquel entonces, investigadores rusos, europeos, australianos, asiáticos, latinoamericanos y norteamericanos han iniciado procesos de investigación, educación y desarrollo de innovaciones en *Big History*. Este es el caso del aporte hecho por Walter Álvarez -geólogo reconocido de la Universidad de Berkeley por su hipótesis acerca de la extinción de los dinosaurios debido al impacto de un meteorito- que, debido al contacto iniciado con *Microsoft*, apoyó la moción de Roland Saekow, su discípulo, para el diseño de un dispositivo tecnológico apto para la creación de líneas del tiempo consecuentes con la "Revolución Cronológica" propuesta por *Big History*: el Chronozoom.

Si bien el uso del *Chronozoom* ha sido usado diferencialmente en las aulas, el potencial pedagógico de la perspectiva, fue desarrollada *in extenso* por la Universidad Dominicana de California, en un grupo liderado por Mojgan Behmand basado en el libro de Cynthia Stokes Brown. Por otro lado, entre los años 2011-2012, el convenio entre David Christian y Bill Gates, dio lugar a la creación del proyecto *Origins*, o *Big History Project*, para su enseñanza en las escuelas norteamericanas, australianas y surcoreanas. Este proyecto es amparado por *International Big History Association*, aunque es un proyecto con una autonomía propia y una proyección para países como Australia y EE.UU. Aun así, en el caso holandés, por ejemplo, en la actualidad hay más de 15 colegios que se encuentran implementando el núcleo del proyecto.[4] Algunos de los avances teóricos y de los resultados de la investigación pueden conocerse a fondo en una obra fundamental publicada en 2007, *Mapas del tiempo: Introducción a la Gran Historia*[5].

Tras casi 30 años del proyecto se pueden celebrar todos los hitos descritos y, sin duda, se debe sumar uno más: la publicación, 2011, del libro *El lugar del hombre en el cosmos*, de Fred Spier.

Este libro incluye varias innovaciones que han sido producto de los cursos y conferencias que se estructuraron en la Universidad de Ámsterdam. En él es posible resaltar el vínculo entre historia humana e historia natural que había formado parte de las inquietudes de su mentor[6] y su colega Norbert Elías[7]. También es posible notar que el texto es el resultado de la cooperación intelectual entre especialistas que investigan distintos campos, antes que de las especulaciones de sabios interesados en escribir sobre el espectro historiográfico de la totalidad -como se había intentado con la *Historia Universal* en los siglos XVIII, XIX y XX-. No obstante, aunque el proyecto pueda parecer un intento de "historia total", Spier reconoce que en *Big History* los investigadores no pretenden ser concluyentes y, por tanto, que el enfoque está y estará abierto al diálogo y los hallazgos de las nuevas investigaciones.

En *El lugar del hombre en el cosmos*, los lectores podrán encontrar algunas novedades y distinciones respecto de otros libros del género. A través de la

3 Nota de los Traductores: Debemos esta importante información a los comentarios del profesor Spier.

4 Nota del traductor: Agradecemos esta información a los comentarios del profesor Spier.

5 David Christian, William H McNeill, y Antonio-Prometeo Moya, *Mapas del tiempo: Introducción a la Gran Historia* (Barcelona: Crítica, 2010). La versión en inglés fue publicada en 2004.

6 Johan Goudsblom, *Fuego y civilización* (Buenos Aires: Andres Bello, 1995).

7 Norbert Elias, *El proceso de la civilización : investigaciones sociogenéticas y psicogenéticas (Sociología / Sociology)*, First (Fondo de Cultura Económica, 2010).

apuesta teórica de un astrofísico, Eric Chaisson[8], Spier construye una visión del universo, de la historia biológica y de la historia humana que rastrea las variaciones de los flujos energéticos en la conformación de distintos sistemas complejos: a lo largo de la historia del universo -debido a las condiciones Goldilocks- aparecen transiciones[9] caracterizados por variaciones sustanciales en el medio que determinan el surgimiento de auténticas novedades en el universo; la aparición de las primeras estrellas a partir de átomos y de elementos más pesados a partir de estrellas muertas es uno de estos momentos de transición. Si bien el enfoque de David Christian y el *Big History Project* han periodizado al menos 8 umbrales para entender los flujos de energía, la posición del profesor Spier no colinda con este esquema para la descripción de las condiciones Goldilocks en sistemas complejos en donde, durante un breve periodo de tiempo, la organización de la energía ha vencido a la tendencia entrópica del desorden para configurar sistemas tan complejos como el cerebro humano.

Otro punto central en el libro de Spier es, como lo señala el título de su libro, el futuro de la humanidad. Especialmente interesado en los mecanismos de aprovechamiento energético, Spier examina posibles transiciones hacia sistemas energéticos acordes con las condiciones Goldilocks de la especie sin que la misma sea destruida por el agotamiento de recursos y la producción excesiva de entropía.

En este punto parece haber un disenso importante entre la obra de Christian[10] y la de Spier. Si bien Christian sostiene que es posible una transición hacia un modo de vida sostenible sin sacrificar tecnologías frías, Spier es escéptico a que se pueda dar esa transición energética sin sacrificar el uso de las mismas. Las dos perspectivas son relevantes en tanto derivan de la lógica que articula los dos libros: el libro de Christian se preocupa por la presentación al lector de un "mito moderno de la creación", mientras que Spier está interesado en el hallazgo de patrones y variaciones en la densidad energética de los sistemas complejos.

Es posible que las dos visiones se configuraran con relación a los distintos campos académicos que anteceden la formación de los dos autores: Christian[11], parte de una premisa en la que no se busca de sistemas alternativos al capitalismo, tal vez debido a su conocimiento pormenorizado de la historia rusa y del socialismo real; para Spier la búsqueda de sistemas alternativos al actual hace parte de su agenda, porque conoce de primera mano la situación de subdesarrollo de América Latina (donde desarrolló su tesis doctoral) además de estar interesado en las relaciones sostenibles de la especie con el medio ambiente.

Por último, en la obra de Christian como también en la de Spier hay una serie de argumentos con relación a lo que hace tan únicos a los sistemas complejos de la especie humana en comparación con los demás sistemas que integran al universo. Para ello, la *Big History* han centrado su atención en una teoría del aprendizaje: en los seres humanos, el desarrollo del cerebro, funciona a través de un complejo programa que se integra al desarrollo cultural de cada sociedad, en el que se aprende aquello que otros han legado. La complejidad misma de los sistemas que integran los seres humanos esta mediada por esta capacidad de integrar a sí mismos un proceso histórico-cultural, de ser proceso en un proceso socio genético.

Varios de estos aspectos son materia de la siguiente entrevista.

8 Eric Chaisson, *El amanecer cósmico: orígenes de la materia y la vida* (Barcelona: Salvat, 1994).

9 Nota de los traductores: El término "umbrales" apareció por primera vez en 2011 en el TED talk de David Christian, y después fue adaptado en el BHP y en su libro "Big History: Between Nothing and Everything". Sin embargo, el profesor Spier prefiere usar el término "transición".

10 Christian, McNeill, y Moya, *Íbid.*

11 Nota de los traductores: En correspondencia sostenida después de la entrevista, el profesor Spier ha expresado que considera que la diferencia en la formación, pregrado y posgrado, de cada uno ha influido en las diferencias frente a estos puntos de vista. Es preciso recordar que el profesor Spier hizo carrera en la bioquímica - primeramente, y después en antropología cultural e historia social.

Entrevista

Equipo Entrevistador (E.E.) La primera pregunta es un poco más biográfica que cualquier otra cosa ¿cómo usted llega a esta idea de Big History y cómo se acerca en un primer momento al problema de Big History?

Fred Spier (F.S.) Bueno, yo encontré la Gran Historia por medio de mi supervisor Johan Goudsblom, él había leído un artículo en de Journal of World History que había escrito David Christian sobre su curso en Macquarie University, este fue en el 91, yo estaba muy ocupado preparando mi tesis de grado sobre mis investigaciones en el Perú, por lo cual no tenía mucho interés, pero algo lo despertó, tal vez el hecho de que mi trabajo en el Perú estaba vinculado con la pregunta más básica y más grande ¿cómo habíamos llegado nosotros en el planeta a esta situación ecológica en donde nos encontramos? Esta inquietud había llegado en mi juventud, cuando vi esta foto famosa de Apolo 8, que ustedes conocen seguramente, donde se ve la tierra sobre la superficie de la luna tomada por los astronautas. Vi esa foto en el 69 y este cambió completamente mi perspectiva: me di cuenta de que el mundo y la situación presente era bastante distinta en comparación con lo que había aprendido en la escuela, en el colegio, me di cuenta como mucha gente en aquella época, que debemos preguntarnos qué estamos haciendo en el planeta, a dónde vamos, cuáles son los problemas que estamos enfrentando, yo quería saber –entonces- cómo habían llegado a esta situación, tan precaria obviamente.

Previamente estuve estudiando química y terminé con una especialización en bioquímica. Yo creo que fue interesante hacerlo, pero no quería continuar porque no me sentía bien. Quería enfrentar esa pregunta pero no sabía cómo hacerlo, porque no sabía de la historia mundial, no tenía ni idea. Entonces, decidí estudiar una sociedad que viva más vinculada a la tierra, donde básicamente lo que se producen son los productos que también se comen: yo quería saber si ellos -tal vez- tratarían a la tierra en manera distinta, más cuidadosa, por eso fui al Perú. Vivía en un pueblo andino que se llama Zurite, cerca de Cusco (Qosqo) la capital incaica, esa fue mi segunda patria, no lo sabía entonces, pero así se ha vuelto: cada día estoy mirando las noticias, que ahora se pueden ver en vivo desde aquí, el Matutino de Cusco, tengo mis amigos allá y todo eso ha dejado una impresión muy profunda. En aquel pueblo también aprendí a hablar su idioma, en mi manera gringo seguramente, pero también un poco estilo peruano, cusqueño. Puedo escuchar por ejemplo que ustedes no son peruanos, ustedes son colombianos. Yo aprendí realmente mucho, mucho más de lo que pensé, la realidad era un poco distinta a la que pensaba pero todo fue muy interesante.

Terminando esa investigación estuve escribiendo un artículo de historia mundial en términos de historia ecológica. En este momento llegó la Gran Historia. Entonces mi supervisor Johan Goudsblom y yo decidimos intentar organizar un curso que hiciera parte de la iniciativa de Big History en Australia. Lo organizamos en Holanda, en Ámsterdam, hacia el 94, ya hace más de veinte años. El curso fue una enseñanza tremenda, porque era necesario buscar especialistas en otros campos, bueno, astrónomos, geólogos. Ellos no nos solamente dieron su clase, sus charlas, sino también compartieron sus conocimientos con nosotros tomando un vino, una cerveza y conversando sobre todo. Eran una enseñanza tremenda y sirvió para coordinar los cursos. Tuve que leer un montón de libros para mejorar mis conocimientos. Fue un esfuerzo de casi 10 años, pero también me di cuenta que hay ciertos, estoy buscando la palabra correcta en castellano, “patterns” se dice en inglés

E.E. ¿Patrones?

F.S. Sí, esa es la palabra correcta; patrones que solamente se pueden ver cuando uno se ve todo en su conjunto. Así comencé a escribir mi primer libro sobre la estructura de la Gran Historia y después me pregunté si tal vez hay maneras de explicarla. Ya el primer libro a mí me apreció bastante atrevido y riesgoso porque no conocía a nadie que lo hubiera intentado. Después aprendí que hay una serie de historiadores que lo había intentado, pero entonces no sabía en dónde.

Esto pasó antes de comenzar realmente el internet, pero con su llegada, era posible buscar personas, libros, información. Desde este momento comencé a buscar de todo y también a contactar personas, pedirles si tal vez podían venir a Ámsterdam y dar una charla. Felizmente teníamos dinero para hacerlo. Así he elaborado nuestra de red de conexiones y conocimientos, así ha crecido todo. Llegó un momento en que también pensé "ah, sí, se puede explicar la situación de la Gran Historia en cierta medida", este es mi segundo libro, que ustedes también conocen ya que ha sido traducido en castellano.

E.E. En cuanto a eso y teniendo en cuenta que otros investigadores de la Gran Historia han desarrollado sus estudios sobre historia rusa, sobre historia mundial desde Norteamérica, sobre geología o historia de los dinosaurios ¿Cómo marcó la experiencia de haber vivido en y de realizar investigaciones sobre América latina a su acercamiento con la Gran Historia? ¿Tuvo alguna influencia?

F.S. Es difícil juzgarlo para mí, pero yo puedo decir que ha influido de manera realmente profunda, ya nunca voy a recuperar lo que era antes de haber vivido en su continente. No solamente en términos de conocimiento, sino también en términos emocionales ha sido una influencia muy profunda, porque es un continente realmente muy especial que se ha robado mi corazón. También he aprendido hasta cierto punto a mirar desde su continente a la historia mundial, al mundo y a la historia. Me di cuenta, por ejemplo, que la colonización del Perú y de Colombia, estuvo estrechamente vinculada con la independencia de Holanda contra España, porque España tenía ese interés antes que nada en América Latina y la plata que se extraía y era mucho más importante invertir dinero y esfuerzos en América Latina que en Holanda. Pero no puedo juzgar realmente bien que tan profunda fue esta experiencia.

E.E. Entonces, pasemos a la siguiente pregunta que tiene que ver un poco con algo mencionado, es decir la colaboración interdisciplinar. La Big History ha presentado una nueva forma de colaboración entre las ciencias naturales y las ciencias humanas, una nueva forma de interacción entre ellas, ¿cuál cree usted que, bajo esta nueva colaboración, ha de ser el rol de por ejemplo la historia? ¿Cómo afecta esta nueva idea de una historia universal a la disciplina histórica o a los historiadores en general?

F.S. Bueno, yo no puedo juzgar como piensan todos los historiadores/doras, pero creo que la historia humana tiene un nivel de complejidad muy alto y por eso necesita su propio enfoque, su propia teoría. Yo creo que es absolutamente posible entender la historia humana como parte del todo y una gran parte de ese todo es ciencia natural. Por ejemplo, nuestros cuerpos son organismos que funcionan de forma biológica, todos necesitamos comer, beber, protección. Mucha gente pasa todos sus días buscando satisfacer esas necesidades y casi no tiene tiempo para hacer otras cosas como pasaba en el pueblo de Zurite. Es un lujo que existe para gente como yo que se dedica a estudiar cosas, a tomar distancia, charlar, y escribir. La gran mayoría de la gente en la historia de la especie no ha tenido tal lujo, ellos siempre están luchando por solventar sus primeras necesidades, necesidades bastante básicas. Todavía queda muchas personas que viven en estas circunstancias, que luchan por recursos naturales, por tierras, por otras personas. Este es uno de los sentidos en que la historia humana tiene que ver con recursos naturales y hay que entenderlo así, tal vez un poco más de lo que piensan muchos historiadores.

E.E. De acuerdo, y con relación a la perspectiva que aparece con la Big History ¿Hay una ventaja para los seres humanos, para la especie, si se comprende la historia en los términos de la más larga duración posible? ¿Qué representa para nosotros la integración en solo conjunto de la historia del universo y de la historia humana?

F.S. Bueno, para determinar los rasgos generales sí, en su detalle no, obviamente. Como cuando queremos escribir una historia personal cuántos detalles se pueden mencionar, muy pocos, porque se pueden llenar libros y libros con los detalles. En los rasgos generales se pueden colocar algunos detalles para

describir, pero la gran mayoría de los datos no se usan realmente, siempre uno busca rasgos generales y también ilustraciones. Es lo que dijo Ptolomeo cuando escribió su cosmología, su geografía y su, es lo que él llamó jorografía, para él había hubo una diferencia entre geografía y jorografía, geografía era geografía mundial, entonces describía el globo y todos sus rasgos generales, mientras jorografía describió una región, una ciudad más en detalle, y ya dijo "cuando se hace geografía se buscan rasgos generales, cuando se hace jorografía se buscan más detalle local" y es siempre lo mismo, no hemos cambiado y esta discusión sigue pasando ya por casi dos mil años, creo.

E.E. Con relación a estas grandes transformaciones propias de la especia humana, el grado de complejidad de las sociedades humanas es tal vez el grado más grande que conozcamos hasta ahora en el universo y fruto de eso ha ocurrido una gran transformación en la tierra: dejando a un lado lo que pasó con las bacterias, los humanos han causado el mayor impacto en la biosfera en muy poco tiempo.

F.S. Sí, es cierto.

E.E. En ese sentido, también hay una reflexión, hay cierta conciencia de que busca explicar la transformación de la biosfera y tiene que ver con las condiciones bajo las cuales la especie conoce y aprende.

F.S. Sí, en cierta medida

E.E. ¿Se podría tratar de considerar qué es lo auténticamente humano con relación al aprendizaje y al conocimiento, lo auténticamente nuevo si se compara con otras especies? Y sobre todo atendiendo al término este de autonomía que más o menos se ha manejado desde la biología para entender la diferencia creciente entre el medio y los organismos que lo integran, ¿se podría decir que con los humanos se ha llegado a un nuevo nivel de autonomía en relación con el ambiente, con la biosfera, fruto de su proceso de aprendizaje?

F.S. Por el momento sí, pero no sabemos por cuánto tiempo va a continuar porque estamos malogrando lo conseguido y, si este es el caso, ¿qué vamos a hacer? Yo tenía mucho miedo por las generaciones venideras y por lo que estamos haciendo con relación a ellos, por eso comencé a estudiar todo esto. En este momento siento ese mismo temor: creo que comprendo un poco mejor nuestra situación, pero también sé que lo que tenemos que hacer es actuar. En los años setenta, tal vez ochenta, del siglo pasado hubo más conciencia y más esfuerzos que ahora por parte de gente y de empresas grandes. Algunos esfuerzos permanecen, como la electrificación con recursos renovables, pero, hay una lucha muy fuerte en el mundo sobre recursos naturales entre Estados Unidos, China, Europa, y Rusia. Esto ocurre también en América Latina con la explotación minera China en el Perú, por ejemplo. No sé qué está pasando en Colombia en ese respeto.

Lo que más quisiera en este momento es que la gente sea consciente de dónde estamos y actúe. Esta es mi opinión personal: ya que somos ciudadanos del planeta, deberíamos actuar para organizar un mundo en donde podamos vivir en paz y energéticamente estables, esa es mi esperanza y por eso estoy haciendo esto. No sé si mucha gente piense así y quiera hacerlo, pero ¿qué puedo hacer? Es mi esperanza.

E.E. Para lograr un cambio cultural y un grado de reflexividad sobre estos problemas a nivel mundial, desde su perspectiva ¿considera necesaria una teoría histórica que vincule no solo, las relaciones con el medio ambiente, sino también el problema del cambio cultural y el aprendizaje en el proceso de transformación de las sociedades humanas?

F.S. Sí, todo es importante, y todo depende de la sociedad en donde uno se encuentre. Yo puedo comprender fácilmente por ejemplo que en países con menos recursos económicos la Gran Historia no está interesante, es tal vez algo un poco raro para muchas personas, porque no da una respuesta para sus necesidades más directas. Pero no voy a decir que la Gran Historia es la única manera de realizar ese ideal: yo creo que tal vez las religiones pueden ser más eficaces en tales situaciones, no lo puedo juzgar. Tal vez hay un sinfín de maneras de hacerlo. La gran historia es una de las maneras y es mi manera

de hacerlo.

E.E. La perspectiva de la Gran Historia abre posibilidades que no necesariamente pueden ser captadas por toda la humanidad en este momento, sin embargo, a partir de sus postulados existe la posibilidad de conectar nuestra historia con la historia del universo algo que anteriormente no se podía, no había forma.

F.S. Sí. Lo que pienso es que la Gran Historia es la primera forma de historia que ofrece la posibilidad de hacer una historia mundial que sea aceptada por muchas personas en países distintos, pero exige una discusión profunda con estas personas y estas culturas. Por eso estoy muy interesado en qué opinan ustedes con su perspectiva colombiana, que seguramente no es uniforme ya que sin duda hay varias perspectivas al interior de su país. Creo que estamos al comienzo de una discusión en esos términos y por eso estamos al comienzo del proyecto de Gran Historia, no al final. A mí me gustaría mucho que sucediera esa discusión abierta con gente de muchas culturas: qué opinan, qué piensan, qué falta, qué podemos mejorar, esto sería sumamente interesante.

E.E. Tenemos una pregunta con relación a dos puntos que usted ha mencionado, el primero es el panorama preocupante de la explotación de recursos energéticos de toda la tierra y la producción de agentes contaminantes que causan un alto nivel de entropía en el sistema y el segundo, las alternativas que han surgido para poder contrarrestar los efectos de esa entropía como por ejemplo el desarrollo de nuevas tecnologías o el surgimiento de organizaciones de ciudadanos y organizaciones sociales que han empezado a intervenir y a luchar por esos recursos naturales en distintas regiones del planeta. Estas son dos caras del panorama, por una parte la producción creciente de la entropía, y por otra parte las respuestas que empiezan a surgir para poder equilibrar el sistema.

Nos preguntábamos si el creciente proceso de la neoliberalización en una economía de libre mercado –que llegó tras la disolución del sistema bipolar de la guerra fría y que coincide con el cambio en la conciencia frente al medio ambiente que mencionaba- estaría creando una transformación en el planeta que puede alcanzar un punto de histéresis muy alto con consecuencias ambientales que sean imposibles de revertir ¿Qué posibilidades cree que podría haber frente a la hegemonía del neoliberalismo y los altos niveles de entropía generados por la economía de libre mercado?

F.S. Bueno, estoy perfectamente de acuerdo, eso también es una preocupación mía. Quisiera que por ejemplo los Estados Unidos se comportara menos arrogante y hubiera más colaboración. Creo que es la intención del presidente Trump quien por lo menos quiere colaborar con Rusia. También tiene que ver con la falta de información realmente correcta en la opinión pública: es difícil decirlo, hay mucha propaganda, como ustedes seguramente saben. En ocasiones pienso que la prensa es más abierta, más crítica en América Latina que en los Estados Unidos o que en Europa. Por ejemplo, cuando veo El Matutino en Cusco escucho preguntas muy críticas a sus autoridades, a toda la gente, no quieren hacer propaganda. Hay una actitud más abierta, más crítica en América Latina que en muchos otros sitios y en esto ustedes pueden enseñar al resto del mundo.

No sé cómo escapar al neoliberalismo. Hay que luchar para vencer y hay que concientizar a la gente como pasó ya en los años sesenta, setenta y aun actualmente. Pueda ser que ahora la situación sea peor que antes y los engaños de la prensa no contribuyen a mejorar nuestra información frente a estos hechos. Por esta razón siempre hago énfasis en los dos pilares del método científico: las observaciones y las interpretaciones. Siempre hay que preguntar qué es, cuáles son las observaciones, que siempre contienen ciertas interpretaciones, y cuáles son las interpretaciones, en lugar de responder con retórica frente a un hecho observable. Para mis estudiantes es muy difícil al principio de los cursos porque ellos han aprendido en su escuela, en su colegio, a discutir con opiniones, con retórica, pero sólo ocasionalmente con argumentos basados en observaciones. Eso es importantísimo porque permite analizar una situación, registrar las observaciones, controlar las

interpretaciones. La fuerza de la ciencia se basa en estos pilares y hay que aplicarlos bien. Difundir estos pilares es uno de los objetivos de mi clase mostrando observaciones, experimentos.

E.E Perfecto, ahora quisiéramos anotar que desde el enfoque de la Gran Historia se puede sostener que las sociedades actuales han logrado altísimos niveles de complejidad. Sin embargo, los datos se han obtenido en su mayoría de la mediciones en los niveles de consumo energético en los países con mejor nivel de vida, con mayor producto interno bruto y con un altísimo desarrollo tecnológico ¿Qué ocurre si observamos el consumo energético de países con escasos recursos, con altos niveles de pobreza en los que las personas tienen un acceso escaso a tecnologías de punta? ¿Podríamos hablar de una tendencia uniforme en el incremento de la complejidad del planeta? ¿Bajo qué condiciones la Gran Historia ha observado esas variaciones sistémicas en los grados de complejidad que hoy en día son diversos grados de complejidad en distintos puntos del planeta?

F.S. Estoy absolutamente de acuerdo y me di cuenta viviendo en el pueblo andino; supe que ellos no estaban causando el problema sino nosotros en Holanda, por ejemplo. Si hay un "crack" que cambie las condiciones en las que vive la humanidad, los habitantes de este pueblo van a sobrevivir más fácilmente que nosotros: ellos siempre van a tener su tierra, sus animales, su maíz, sus papas. Sin embargo, ellos también buscan avanzar, cambiar, también quieren este lujo de los países ricos y comprendo muy bien que lo quieran.

¿Cómo hacer para que todos en la tierra tengan las condiciones de vida que disfrutan los habitantes de países ricos? No lo sé, pero hay que buscar maneras en una discusión continua, es la única forma de hacerlo. La voluntad de dialogar con las personas que se encuentra en un país, con su cultura, con su mundo es un paso para alcanzar ese objetivo, pero también entiendo que las situaciones económicas son muy desiguales, los conocimientos desiguales, las oportunidades desiguales, me doy cuenta de eso y no sé cómo solucionarlo. Creo que el respeto mutuo hace parte del cambio, que tomemos con respecto a los demás a ver qué pasa. Esto es bastante difícil como ustedes saben en Colombia.

E.E. Ahora bien, en su libro *el lugar del hombre en el cosmos* usted ha hecho énfasis en que muchos de los cambios de la especia humana se deben a la interacción con el medio ambiente, un énfasis muy interesante que se podría haberse tomado desde la historia ambiental. No obstante, es en la especie humana aparece una característica singular, la autonomía constructiva: gracias a ella la especie pudo producir cambios en el ambiente que afectaron toda la biosfera, cambios relativamente independientes de los límites impuestos por el medio. Nuestra pregunta es ¿cómo se explican las transformaciones de la historia humana desde la Gran Historia tomando en la mira a las formas de organización social que fueron condición para esos cambios? Norbert Elías -por ejemplo- propone la relación sociogénesis/psicogénesis[12], Randall Collins lo elabora a través de una teoría de la conflictividad[13], Marx hablaba de una lucha de clases como motores de la historia humana[14], ¿cómo lo observa la Gran Historia en este caso particular?

F.S. Bueno, una pregunta muy interesante y básicamente nos muestra que falta una teoría sobre la historia humana todavía. Creo que la sociología de Norbert Elías ofrece una manera de pensar muy interesante, pero no ha sido elaborado suficientemente todavía y es una tarea que tenemos que hacer. Estuve trabajando en eso, y también David Christian quería hacerlo con su aprendizaje colectivo. Pero lo que falta es una teoría que ofrezca un marco general para entender los cambios históricos. Pero, sí, realmente sí hace falta para complementar la perspectiva de la Gran Historia, estoy completamente de acuerdo.

E.E. Desde el punto de vista de la gran historia ¿El

12 Elias, *El proceso de la civilización*. Investigaciones sociogenéticas y psicogenéticas. (México D.C: Fondo de Cultura Económica. 2015).

13 Randall Collins, *Sociología de las filosofías: una teoría global del cambio intelectual* (Barcelona: Hacer, 2005).

14 Karl Marx y Friedrich Engels, *Manifiesto comunista* (Madrid: Alianza Editorial, 2001).

asunto del aprendizaje sería una parte fundamental para este complemento? ¿Debería ser uno de los pilares de la teoría que hace falta? Tal vez el término de psicogénesis en Elías pueda vincularse con ello.

F.S. Sí, creo que sí. Lo que ustedes ven con Elías, este énfasis en aprendizaje, no existe tanto en su teoría: el habla más sobre cambios en el comportamiento que también son formas de aprender, pero no tiene una teoría realmente elaborada en este se sentido. Es posible incorporarlo, lo creo, pero no lo han hecho todavía. Creo que hay que combinar esta idea de aprendizaje con su teoría, pero también el olvido: también estamos olvidando, la combinación de estos dos procesos con estructuras de poder, interdependencias y habilidades propias de cada sociedad es lo que está de por medio en este acercamiento.

E.E Usted ya había desglosado un poco algunas ideas de por qué Big History en Latinoamérica no ha calado tanto, ¿Podría elaborarlo un poco más? ¿Por qué cree que esa perspectiva no ha cobrado tanta fuerza?

F.S. Si, claro. Ahora, estoy estudiando la cosmografía española, no sé si ustedes saben algo de eso, yo no sabía mucho de eso. Por ejemplo, me di cuenta estudiando la historia del Perú que había cosmógrafos como José de Acosta, que escribió su *Historia Natural y Moral de las Indias* (en aquella época historia moral significó historia humana); ahora yo estoy leyendo un libro que se llama "*Secret Science: Spanish Cosmography and The New World"*[15], así lo publicaron en Estados Unidos, o en español "Ciencia secreta: Cosmografía española y el nuevo mundo". Lo que hicieron los españoles cuando comenzaron a dominar a América Latina fue recopilar información, formar imágenes que permitieran el control de rutas marítimas. Ellos buscaron mucha información y la enviaron España. Allá construyeron grandes imágenes celestes y de la tierra, sus características, sus recursos, y sus habitantes que se llamaron cosmografía, pero lo hicieron en secreto porque no querían que otros lo supieran. En las colonias no tenían estas imágenes más completas y generales, pero en España sí. Los holandeses lograron conseguir algunas, por lo cual me fue posible comprar en Ámsterdan un mapa del Perú de 1640 en el que se indica el lugar donde hice mi trabajo, *Xaquixaguana* en Quechua, mientras que en el Perú no pude comprar ni encontrar ningún mapa antiguo. Es más: existían los datos desde donde se podía elaborar el mapa, pero no en el Perú sino en España. Esto pasó en Colombia también.

La colonización dejó a los pueblos colonizadas en una posición dependiente y ello explica que no hay una tradición de cosmografía en América Latina mientras que sí hay una en España. Esta condición de monopolio del conocimiento también explica que haya interés en la Gran Historia en España, pienso, como hay una tradición de cosmografía en Holanda. Creo que ustedes tienen esa desventaja, en ese sentido, todavía es una herencia colonial. Hay que luchar para hacerlo consciente porque tenemos que superarlo. Superar esta desventaja va a costar tal vez generaciones, sin embargo, pueda que si se vuelve más consciente sea más fácil de superar. Sobre esto estoy pensando escribir y tal vez sería interesante que en cada país de América Latina se escribiera una historia en estos términos. Por ejemplo, hay un gran historiador de Colombia, Antonio Vélez[16] que podría escribir una historia así.

E.E. Bueno, queríamos preguntarte por último sobre los proyectos que tiene para el futuro.

F.S. Ya diría que escribir sobre esta idea de cosmografía antigua y la Gran Historia, que también se encuentra en China en donde es una tradición de Dao. Yo creo que en cada país al menos hay una persona que quiera hacer una Gran Historia, y también estoy trabajando sobre la historia de plantas, bacterias, animales y cómo también la gente los ha utilizado en su medio ambiente.

E.E. Existen dos proyectos en curso con relación a la propuesta de la Gran Historia en la Universidad de Ámsterdam. El primero tiene que ver con las pequeñas

15 María M Portuondo, *Secret Science: Spanish Cosmography and the New World*, (2013).

16 Antonio Vélez Montoya, *Del big bang al homo sapiens.* (Bogotá: Villegas Editores, 2004). No obstante, las primeras ediciones de sus libros fueron publicadas en la década de 1990.

grandes historias, ¿cuál cree que es el propósito para el futuro de este enfoque? ¿Qué opina del proyecto de grandes historias de ríos, como el Nalón en España?

F.S. Yo creo que este proyecto en España tiene este potencial para reunir a personas de la universidad, para colaborar. El problema es que hay muchos asuntos en los cuales se pueden desarrollar pequeñas grandes historias, pero ello no implica que contribuyan a edificar un cuerpo teórico más claro y total; esto es algo que falta. Estoy pensando que sería posible construir algo que realmente contribuya a una imagen más general de la gran historia. Esta es mi esperanza. Las pequeñas grandes historias no lo hacen tanto hasta ahora, aunque dan mucha motivación a los estudiantes.

E.E. Y el segundo, por esa misma línea, son los cursos ofertados en Coursera, las plataformas educativas MOOC y toda la apuesta educativa de la Gran Historia tanto en escuelas de los Países Bajos, Estados Unidos, Australia, Corea del Sur. La virtualidad y el internet nuevamente permiten que los postulados de la Gran Historia lleguen a un público más amplio, y ustedes en la universidad de Ámsterdam acaban de lanzar un curso de este tipo ¿cuáles son las expectativas para esos cursos y para esas plataformas educativas en el futuro?

F.S. Bueno, con relación a las expectativas veremos la cantidad de personas que lo van a tomar, pero también hay un aspecto político: para la Universidad de Ámsterdam es importante mostrar que puede hacer cursos internacionales, por ese motivo hemos conseguido el dinero. Para el sistema de "burócratas" esto es importante, y nosotros siempre estamos en una constante lucha por los recursos, que se define por la cantidad de gente que va a tomar los cursos. No sé qué va a pasar, es imposible predecirlo, vamos a ver. También espero que estos cursos se dicten en otros idiomas, en español obviamente. Ustedes podrían comenzar uno.

E.E. Como le contamos apenas estamos reuniéndonos, conversando, haciendo algunos proyectos y esperamos que podamos continuar también con la iniciativa de como grupo ir conversando sobre temas de la Gran Historia, informándonos, dándolo a conocer, etc.

Cuando hicimos sesiones informativas para poder crear el grueso de las preguntas llegábamos a una conclusión también, nos parecía muy diferente lo que habíamos visto en la disciplina de lo que ustedes estaban intentando proponer como Gran Historia: ustedes ofrecen más tendencias y patrones, explicaciones más que solo una descripción de lo que había ocurrido, que es aquello a lo que tradicionalmente se ha hecho. En ese sentido, para nosotros han sido una novedad completa y por eso también creemos que es muy valioso empezar a hablar sobre estos temas aquí en nuestro país.

Muchísimas gracias por esta conversación.

Conclusión:

Como aparece en el curso de la entrevista, Fred Spier buscó explorar, a través de *Big History,* el largo proceso que une nuestra historia con la historia natural: la densidad energética como un recurso metodológico para entender nuestro presente y pasado nos conecta con la historia de todo el universo, con los principios más básicos en los cuales tuvo lugar el surgimiento de auténticas novedades como estrellas y galaxias. Por otro lado, también aclara la necesidad urgente de una revolución en el aprovechamiento de la energía y describe la dramática situación ecológica a la que hemos llegado. En este contexto, la posibilidad de convivencia pacífica entre los miembros de la especie se nutre de una nueva dimensión que pone en perspectiva las diferencias locales en el uso de energía (medida en en términos del control de recursos naturales y posibilidades tecnológicas) así como su impacto en las relaciones mundiales.

Con su enfoque, la Gran Historia abre nuevas posibilidades para responder algunas de las preguntas más relevantes para la humanidad, por ejemplo el futuro de la sostenibilidad ecológica. Es una historia dirigida al conjunto de los miembros de la especie, independientemente de la procedencia nacional de los interesados en conocerla. Por eso mismo, aún es un proyecto con una agenda abierta que tiene como principal objetivo construir una imagen más realista

del mundo y su historia.

Por otro lado, la Gran Historia ofrece un nuevo plano para reflexionar acerca de nuestra situación: dado que la magnitud del impacto humano en la tierra ha sido mucho más veloz que en cualquier momento histórico anterior, es preciso ser conscientes del aumento en los niveles de entropía que los humanos han causado en la tierra. Solo a partir de esta consciencia se pueden asumir desde una perspectiva más distanciada el potencial creativo y destructivo de las distintas formas de organización en que hemos vivido y, eventualmente, buscar una forma para conducir al futuro de la especie humana hacia un rumbo más ecológico, pacífico, sostenible.

Para Fred Spier, los argumentos que la *Big History* no son simple retórica, sino que se derivan de dos pilares fundamentales: la observación y la interpretación. Con ello se pretende controlar visiones ideológicas que pueden cegarnos frente a los problemas más grandes de la humanidad -el cambio climático por ejemplo- o mantener sistemas sociales nocivos que pretendan resolver los problemas actuales a través de soluciones obsoletas como los modos de producción industrialistas o totalitarios. De ese modo, la *Big History* constituye un cumulo de observaciones que desmitifican opiniones retóricas, una de las funciones para las que usa su fuerza investigativa.

En la entrevista queda claro que aún es necesario integrar en la perspectiva de la Big History los registros más avanzados a los que han llegado los investigadores de la teoría del conocimiento y del aprendizaje. De ese modo, se abre un nuevo campo para explorar la complejidad de la historia cultural humana en las distintas formas de organización social.

La Big History está lejos de ser una teoría cerrada y total: es una perspectiva abierta a la investigación, sustentada en observaciones muy sólidas a nivel teórico y con una agenda aún muy grande por explorar. Es apenas el comienzo. Desde Latinoamérica, ¿qué se puede construir?

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From Big History to la Gran Historia? A Conversation with Fred Spier

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Introduction

Big History is a historical process-oriented perspective that integrates the scales of space-time explored through twentieth and twenty-first century historiography (short, medium, large, and very large durations) using some of the best available knowledge of natural history, including the formation process of the cosmos. In doing so, it seeks to achieve a specific objective: to connect human history with the history of the universe through an interdisciplinary investigation.

This perspective emerged in 1989 in the form of an elective course that aimed to present a general overview of the discoveries made by the modern historical sciences. Although the course was developed as an isolated initiative at the University of Macquarie in Sydney by David Christian, it sparked the interest of academics such as Johan Goudsblom at the University of Amsterdam in the Netherlands.

Later in 1994, Goudsblom and his student Fred Spier designed a similar course in Amsterdam that had great success. Due to its phenomenal reception, including a radio program and the growing number of researchers that adopted the agenda of Big History, Spier found a favorable context to publish his first book about the subject titled *The Structure of Big History.*[1]

Based on this academic environment, Christian and Spier organized surveys and international conferences with astrophysicists, geologists, biologists and complexity theorists while seeking to develop a strategy to unite *natural history* with *human history*. From this effort new comparative and interdisciplinary methodologies emerged, consolidating a historical account in which the vagaries of humanity were linked to the vagaries of the Earth and the universe. Although such perspectives had already been considered within *World History*, *Big History* could explore new aspects of the process by adopting a temporal scale that included the emergence of galaxies and the complexity of life within one single field of study.

Since the birth of *Big History*, its members have worked continuously with researchers of *World History*. In his book *Big History and the Future of*

1 Fred Spier, *The Structure of Big History: From the Big Bang until Today* (Amsterdam: Amsterdam Univ. Press, 1996).

Carlos Daniel Pérez (Universidad Nacional) y César Duque Sánchez (Universidad del Rosario) on February 27, 2017 interviewed Fred Spier, University of Amsterdam, who is the author *of La Gran Historia y el futuro de la humanidad* (*Big History and the Future of Humanity*).

Humanity[2] Fred Spier pays honor to the unparalleled support by William McNeill, one of the most prominent authors of *World History*. Additionally, since the 1980s David Christian has been an active member of the *World History Association* (WHA), of which he still forms part. However, the *WHA* and the proliferation of *World History* as an approach were not involved in the birth of the autonomous organization that brought researchers of *Big History* together.[3] In 2010, during a small conference convened by Walter Alvarez and Sandro Montanari, in Coldigioco, Italy, the participants decided to create the *International Big History Association* due to the success of this approach in the world.

Since that time, researchers from Russia, Europe, Australia, Asia, Latin America, and North America have started investigations, education, and the development of innovations in *Big History.* This is, for instance, the case with the contribution made by Walter Alvarez, a geologist from the University of California, Berkeley, who is well known for his hypothesis about the extinction of dinosaurs caused by the impact of a meteorite. Using his contacts at *Microsoft* he supported the project of his student, Roland Saekow, of designing a software tool that creates time lines according to the "Chronological Revolution" proposed by Big History, in other words: Chronozoom.

Although *Chronozoom* was initially used in various ways within education, its pedagogical potential was developed more fully by Moigan Behmand and her group at Dominican University of California in a curriculum based on the book by Cynthia Stokes Brown. Meanwhile, David Christian and Bill Gates had agreed to create the *Origins* project, or the *Big History Project*, to teach it in secondary schools in Australia, the United States, and South Korea. This project is supported by the *International Big History Association.* However, it is an autonomous project aimed at countries such as Australia and the United States. Nonetheless, in the case of the Netherlands, for instance, more than thirty high schools have implemented the core of its curriculum.[4] Some of the theoretical advances and research results resulting from Big History investigations can be found in a fundamental book published in 2004, David Christian's *Maps of Time: An Introduction to Big History*.[5]

After nearly thirty years of the project, it may be time to celebrate its achievements, while one more milestone may be added: the 2010 publication of Fred Spier's *Big History and the Future of Humanity*.

This book includes various innovations that have come as a result of the courses and lectures hosted by the University of Amsterdam. In this book, the important connection between human history and natural history is emphasized that was already part of the inquiries of his mentor, Goudsblom,[6] and his colleague Norbert Elias.[7] It is also worthy to note that the text is a result of the intellectual cooperation between a number of specialists among various fields of study rather than of the speculations of scholars interested in writing about the historiographical spectrum of everything – like it was attempted with *Universal History* in the 18th, 19th, and 20th centuries. Nevertheless, although the project may appear to create a "total history", Spier acknowledges that in *Big History* the researchers cannot claim to be conclusive and, therefore, that the approach is and will be open to dialogue and to the findings of new research.

2 Fred Spier, *El lugar del hombre en el cosmos: la gran historia y el futuro de la humanidad* (Barcelona: Crítica, 2011).

3 Interviewers' note: We owe this important information to comments by Dr. Spier.

4 Interviewers' note: We are grateful for this information from comments by Dr. Spier.

5 David Christian, William H McNeill, y Antonio-Prometeo Moya, *Mapas del tiempo: Introducción a la Gran Historia* (Barcelona: Crítica, 2010). The English version was published in 2004.

6 Johan Goudsblom, *Fuego y civilización* (Buenos Aires: Andres Bello, 1995).

7 Norbert Elias, *El proceso de la civilización: investigaciones sociogenéticas y psicogenéticas (Sociología / Sociology)*, First (Fondo de Cultura Económica, 2010).

In *Big History and the Future of Humanity* readers will encounter some novelties and new insights compared to other books of this genre. Following astrophysicist Eric Chaisson's[8] theoretical approach, Spier constructs an overview of the universe, and of biological and human history, that tracks the changing energy flows within the formation of separate complex systems: due to the Goldilocks conditions, throughout the history of the universe transitions appear that are characterized by substantial changes in the environment that determine the emergence of truly new aspects in the universe.[9] The appearance of the first stars from atoms, and of heavy elements from dying stars, are such transition events. While the approach by David Christian and the *Big History Project* has outlined at least eight thresholds for understanding energy flows, Spier's position does not align with this scheme for describing Goldilocks conditions in complex systems, in which during a brief period of time, the organization of energy flows has overcome the entropic tendency of disorder to produce highly complex systems such as the human brain.

Another central aspect in Spier's book is, as the title of the book indicates, the future of humanity. Especially interested in the mechanisms of harnessing energy, Spier examines possible transitions toward energy systems that are aligned to the Goldilocks conditions of our species, that avoid its destruction by either the depletion of resources or by an excessive production of entropy.

In this respect, there seems to be a notable disagreement between the works of Christian[10] and of Spier. While Christian suggests that a transition towards a mode of sustainable life is possible without abandoning the existing technologies, Spier is skeptical that such a transition can happen without doing so. These two perspectives are significant as they are derived from the logic that is articulated in these books. Christian's book is concerned about presenting to the reader a "modern creation myth", while Spier is interested in finding patterns and variations of energy density within complex systems.

It is possible that these two visions are related to certain academic fields which predate the intellectual careers of the two authors: Christian starts with the premise in which alternative systems to capitalism are not explored, possibly due to his comprehensive knowledge of Russian history and of socialism in reality.[11] While for Spier, the search for alternative systems compared to the current one is part of his agenda due to his first-hand knowledge of the reality of underdevelopment in Latin America (where he researched his doctoral thesis), in addition to his interest in sustainable relations between our species and its environment.

Finally, Christian's book as well as Spier's have made a series of arguments about what makes so unique the complex systems of human beings in comparison with other systems that form part of the universe. In doing so, *Big History* has focused its attention on a theory of learning. In human beings, the development of the brain functions through a complex program which forms part of the cultural development of each society, in which people learn what others have bequeathed them. It is exactly the complexity of the systems that human beings form with each other that is mediated by this capacity to turn them into a cultural-historical

8 Eric Chaisson, *El amanecer cósmico: orígenes de la materia y la vida* (Barcelona: Salvat, 1994).

9 Interviewers' note: The term "thresholds" first appeared in 2011 in David Christian's TED talk, and was later adapted into the BHP and his book *Big History: Between Nothing and Everything*. However, Professor Spier prefers to use the term "transition."

10 Christian, McNeill, y Moya, *Íbid*.

11 Note by the interviewers: In correspondence exchanged after the interview, Professor Spier has suggested that their differences in undergraduate and graduate educational levels may have influenced the differences between these two points of view. Within this context it is important to note that professor Spier first made a career in biochemistry, and later in cultural anthropology and social history.

process, from being part of a process to being part of a socio-genetic process.

As will be seen below, a number of those aspects receives attention in the following interview.[12]

Interview

Interview Group (I.G.) The first question is a bit biographical more than anything else -- how did you come to this idea of Big History and how did you initially approach the problems of Big History?

Fred Spier (F.S.) Well, I discovered *Big History* through my supervisor Johan Goudsblom. He had read an article in *The Journal of World History* that David Christian wrote about his course in Macquarie University, this was back in 1991. I was very busy preparing my doctoral thesis on the research I had conducted in Peru, which is why I didn't give the topic much thought, but it did spark my interest, probably because my work in Peru was linked with this most basic and large question:

"How did we arrive here on this planet in this ecological situation in which we now find ourselves?" This nagging question came to me when I was young, when I first saw the famous photo of Apollo 8, that you all surely know, where you can see the Earth rising over the moon's surface, taken by the astronauts. I saw this in 1969 and it completely changed my perspective: I realized that the world and the present situation were substantially different from what I had learned in primary and secondary schools. I realized, like many people in that era, that we should question what we are doing on this planet, where are we going, and what are the problems we are facing? I wanted to know, then: how did we arrive here, in such an obviously precarious situation.

Earlier I had been studying chemistry and finished with a degree in biochemistry. I found it interesting to do all of that, but I did not want to pursue a further career in it because it did not make me feel good. I wanted to face that question, but I didn't know how to do it because I did not know world history, I had no idea. So, I decided to study a society that lived more closely connected to the land, where basically they eat their own products: I wanted to know if they – possibly – treated the Earth in a different way, with more care. For that reason, I went to Peru. I lived in an Andean village called Zurite, close to Cusco (Qosqo), the Incan capital. That became my second home, I did not know it then, but that is how it turned out to be: every day I am still watching the news, which can now be seen live here, the *Matutino* of Cusco, I have friends there, all of that has left a profound impression on me. In that village I also learned to speak their language, in my gringo way, of course, but also a little in a Peruvian, *cusqueño*, way. I can hear, for example, that you are not Peruvians, you are Colombians. I truly learned a lot, much more than I thought, their reality was a bit different than I previously thought, but it was all very interesting.

At the end of my research project I was writing an article about world history in terms of ecological history. At that very moment *Big History* arrived. It was then that my supervisor Johan Goudsblom and I decided to begin creating a course that follows the model of the *Big History* initiative in Australia. We organized the course in the Netherlands, in Amsterdam, in 1994, now already more than twenty years ago. The course provided a tremendous education, because it was necessary to look for specialists in different fields like astronomers and geologists. They not only gave lectures in the classroom, but they also shared their knowledge with us drinking a glass of wine, or beer, while having conversations about all these things. It

12 Interviewers' Note: The question that provides the title of the interview derives from the reception *Big History* has had among Colombian students that currently make up a hot bed of historical genetic studies in the National University of Colombia. In short, the central point of the discussion is whether what has been called *Big History* is a culminating point of intellectual history, in which it reconstructs all knowledge accumulated by the species to narrate a modern myth or if, alternatively, the point of departure is to think of a general theory surrounding the underpinnings of the diverse complex systems which construct the universe.

was a great learning experience and it served us well in organizing the courses. I had to read lots of books to improve my knowledge. It was an effort of nearly ten years, but I also came to realize that there are certain, I am trying to find the correct word in Spanish, "patterns" they say in English.

I.G. Patterns (patrones)?

F.S. Yes, that is the correct word: patterns that one can only see while looking at the whole. As a result, I began to write my first book about the structure of Big History, and after that I asked myself if perhaps there were ways of explaining it. Already the first book seemed rather daring and risky to me, because I didn't know anyone who had tried to do so. After I had written the book, I learned that a number of historians had tried to do that, but earlier I didn't know where to find them. This happened before the internet, but after it emerged, it became possible to look for people, books, and information. From that moment I began to search for and contact people, asking them if they perhaps would be able to come to Amsterdam and give a lecture. Thankfully, we had the money to do so. That is how I developed our network of connections and knowledge, how it all started to grow. Then, the moment came in which I thought "ah, yes, it is possible to explain Big History to a certain extent", this is my second book, which you know as well, because it has been translated into Spanish.

I.G. Relating to that and having in mind that other researchers of Big History had studied Russian history, world history from a North American perspective, geology, or the history of the dinosaurs, how did the experience of having lived in, and having conducted research in, Latin America relate to your approach to Big History? Did it have any influence?

F.S. It's difficult to judge for me, but what I can say is that it has very profoundly influenced me. I don't think I will ever be the same person again that I was before having lived on your continent. Not only in terms of knowledge, but also in terms of my emotions it has had an overwhelming influence, because this is truly a very special continent that has stolen my heart. Also, I have learned, to a certain extent, to look at world history, the world, and history, from the perspective of your continent. For example, I realized that the colonization of Peru and Colombia was intimately linked with the independence of Holland from Spain, because Spain's main interest was in Latin America, in the extraction of silver, and it was therefore much more important to invest money and efforts in Latin America than in Holland. But I cannot really judge it, because it has been such a profound experience for me.

I.G. So, we now move on to the next question which deals with something that was to some extent already mentioned, which is the nature of the interdisciplinary collaboration. Big History has presented a new form of collaboration between the natural sciences and the social sciences, a new form of interaction between the two. What do you think should be, as part of new collaboration, the role of history? How does this new idea of a universal history affect the historical discipline or historians in general?

F.S. Well, I cannot judge how all historians think, but I think that human history has a very high level of complexity, and because of that it needs its own approach, its own theory. I think that it is absolutely possible to understand human history as a part of everything, and a large part of that entire history is studied through the natural sciences. For example, our bodies are organisms that function in biological ways, all of us need to eat, drink, and have protection. Many people go about their days looking to satisfy those needs and have hardly any time to do anything else, much like how life is in Zurite. It is a luxury that exists for people like me to dedicate their lives to study, take distance, lecture, and write. The vast majority of people throughout the history of our species have not had this luxury, they have continually been struggling to address their primary, rather basic, needs. Today, many people still live in these circumstances, who struggle for natural resources, land, or other people. This is one of the ways in which human history relates to natural resources and needs to be understood as

such, perhaps a little more than many historians may be thinking.

I.G.. Agreed, and related to the perspective that appeared with Big History: is there an advantage for human beings, for our species, if they understand history in terms of the largest possible time-span? What does the integration into one single whole of human history and the history of the universe represent?

F.S. Well, to determine the general characteristics yes, but in detail obviously not. Like, when we want to write a personal history, how many details could we mention? Very few – because you can fill a great many books with those little details. While describing the broad outlines it is possible to mention some details, however the great majority of details are not really used. In doing so one is looking for the broad outlines as well as illustrations. This is what Ptolemy said when writing his cosmology, his geography, and what he called chorography. He made a distinction between geography and chorography. Geography was geography of the world, it described the globe in general terms, while chorography described a region, or a city, more in detail. He said: "while studying geography one looks for the general outlines, but while studying chorography one looks for more local details". It's always the same, we haven't changed, and this discussion has been going on for almost the past two thousand years or so.

I.G. Regarding the great transformations of the human species, the level of complexity of human society is possibly the highest that we know of in the universe. This has led to a revolutionary transformation on the Earth: leaving aside what happened with bacteria, humans have caused the largest impact on the biosphere in very little time.

F.S..: Yes, that is correct.

I.G. In that sense, there is also a reflection, in that there is a certain awareness that seeks to explain the transformation of the biosphere and how it must relate to the conditions within which our species knows and learns.

F.S. Yes, to a certain extent.

I.G. Is it possible to consider what is authentically human in relation to learning and knowledge, what is authentically new when compared with other species? And above all, relating to this autonomy that has been emphasized from biology to understand the growing difference between the environment and the organisms that form part of it, is it possible to say that human have reached a new level of autonomy in relation to the environment, the biosphere, as a result of its learning process?

F.S. For the moment, yes, but we don't know how long it will last, because we are destroying what we have achieved, and, if this is the case, what are we going to do? I was very fearful for the coming generations and for what we are doing in relation to them, that is why I began studying all of this. Right now, I feel the same fear: I think that I understand our situation a little better, but I also know that what we need to do is act. In the 1970s, maybe even the 1980s, of the last century among people and large enterprises there was much more awareness and more efforts than there are today. Some of these efforts remain, like the electrification using renewable resources, but there is a fierce struggle around the world over natural resources between the United States, China, Europe, and Russia. This also occurs in Latin America, including the exploitation of minerals by the Chinese in Peru, for instance. I don't know what is happening in Colombia concerning this matter.

What I would want to happen most at this moment is that people be aware of where we are and act. This is my personal opinion: inasmuch as we are citizens of this planet, we should take action by organizing a world in which we can live in peace and in sustainable ways in terms of in energy use, this is my hope and for that reason I am doing this. I do not know if many people think as I do or want to do so, but what can I do? It is my hope.

I.G. In achieving a cultural change and a degree of reflexivity related to these problems at a global level, in your view, do you consider a historical theory is necessary that connects not only the environment but

also the problem of cultural change and learning as part of the transformation process of human societies?

F.S. Yes, everything is important, and it all depends on the society in which one finds oneself. For example, I can easily understand that in countries with fewer economic resources Big History will not be that interesting, it is perhaps a bit strange for many people, because it doesn't provide answers to their most direct needs. But I am not going to say that Big History is the only way to realize this dream: I think that maybe religions can be more effective in such situations, but I cannot really judge that. Maybe there are endless ways of doing this. Big History is one of those ways, and is my way of doing so.

I.G. The perspective of Big History opens possibilities that cannot necessarily be understood by all of humanity at this moment. However, starting from your position, the possibility exists of connecting our history with the history of the universe, something that was previously not possible, there was no way of doing so.

F.S. Yes, I think that Big History is the first form of history that offers the possibility to create a universal history that can be generally accepted by many people in many different countries, but it requires having deep discussions with those peoples and cultures. That's why I am very interested in what you think, with your perspective from Colombia, which surely is not uniform, given that without any doubt there are various perspectives within your country. I think we are at the beginning of a discussion in those terms, which is why we are at the beginning of the project of Big History rather than at the end. Personally, I would very much like to see an open discussion with people of different cultures: what they think, what their opinions are, what is missing, what can we improve, this would be truly interesting.

I.G. We have a question regarding the two points which you mentioned, the first is the worrying panorama of the exploitation of energy resources around the world and the production of contaminating agents that cause a high level of entropy within the system. The second, the alternatives that have emerged to counteract the effects of entropy as, for example, the development of new technologies or the emergence of organizations of citizens and social groups that have begun to intervene and fight for those natural resources in certain areas around the world. These are the two faces of the panorama, one part is the growing production of entropy, the other is the responses that start to emerge to try to equilibrate the system. We were wondering if the growing process of neoliberalization in a free market economy -that came from the dissolution of the bipolar system of the Cold War and that coincides with the change of the consciousness towards the environment previously mentioned- would be creating a transformation on the planet that can attain a point of extreme hysteresis with environmental consequences that would be impossible to reverse. Which possibilities do you think exist related to the hegemony of neoliberalism and the high levels of entropy generated by the free-market economy?

F.S. Well, I am totally in agreement, this is another concern of mine. I would like to see the United States behave less arrogantly and be more collaborative. I think that is the intention of President Trump who at least wants to collaborate with Russia. It also has to do with the lack of really correct information in the public sphere: it is difficult to say, there is a lot of propaganda, as you surely know. Sometimes I think that the press is more open, more critical, in Latin America than in the United States and in Europe. For example, when I watch *El Matutino* from Cusco I hear very critical questions directed at the authorities, to all people, they don't want to create propaganda. There is a more open, more critical attitude in Latin America than in many other places, and that is something that you can teach to the world.

I don't know how to escape neo-liberalism. There needs to be a fight to overcome its deleterious consequences by bringing awareness to the people in ways that happened in the 1960s and 1970s, even now. It's possible that the situation is now worse than before, and the deceptions of the press don't contribute to improve our information in relation to

this situation. For this reason, I always emphasize the two pillars of the scientific method: observation and interpretation. You must always ask what something is, what are the observations, that always contain certain interpretations, and what are the interpretations, instead of responding with rhetoric when faced with observable evidence. For my students, this is very difficult at the start of each course, because they have learned in primary school, high school, to discuss opinions using rhetoric, but only occasionally with arguments based on observations. This is extremely important because it allows analyzing a situation, recording observations, and checking interpretations. The strength of science is based on those pillars and they must be applied well. Teaching the importance of these pillars is one of the objectives of my classes, showing observations and engaging in experiments.

I.G. Perfect, now we would like to note that from the approach of Big History it can be argued that current societies have achieved very high levels of complexity. However, most of the data have been obtained by measurements of the levels of energy consumption in countries with higher standards of living, with large gross domestic products and with high levels of technological development. What would happen if we observed the energy consumption of countries with scarce resources, with high levels of poverty, in with people who have little access to cutting-edge technology? Could we talk about a uniform trend in the increase of the planet's complexity? Under what conditions has Big History observed such systemic variations in the degrees of complexity in which today there are various degrees of complexity in different areas of the planet?

F.S. I could not agree more, and I realized that while living in an Andean village: I knew that they were not causing the problem, but rather we were in the Netherlands. If there were a sudden disastrous event that changes the conditions in which humanity lives, the inhabitants of this village will survive more easily than us: they will always have their land, their animals, their corn, and their potatoes. However, also they seek to advance, to change, they want this luxury of rich countries, and I understand very well that they want this.

What can we do so that everyone on Earth has the living conditions enjoyed by the inhabitants of rich countries? I don't know the answer, but we can look for ways in an on-going discussion, it's the only way to do that. Being willing to enter into a dialogue with people from different countries, with their own culture, in their own world, is something we can do to achieve this objective. But I also understand that the economic situations are very unequal, knowledge is unequal, opportunities are unequal, I realize this and I don't know how to solve this. I think that mutual respect is part of the change, that we respect others and then see what happens. This is extremely difficult, as you know in Colombia.

I.G. In your book *Big History and the Future of Humanity* you emphasize that many of the changes of the human species are predicated on their interaction with the environment, a very interesting point that could have been taken from environmental history. However, in the human species there appears to be a singular characteristic, the constructed autonomy: thanks to this, our species could produce changes in the environment that affect the biosphere, changes that are relatively independent from the limits that are posed by the environment. Our question is: how are the transformations of human history explained from Big History, taking into account the forms of social organizations that provided the conditions of those changes? Norbert Elias - for example - proposes a relation between sociogenesis and psychogenesis.[13] Randall Collins elaborates it through his theory of conflict,[14] Marx spoke of class struggle as a driving force of human history,[15] how does Big History look

13 Norbert Elias, *El proceso de la civilización*. Investigaciones socio- genéticas y psicogenéticas. (México D.C: Fondo de Cultura Económica. 2015).

14 Randall Collins, *Sociología de las filosofías: una teoría global del cambio intelectual* (Barcelona: Hacer, 2005).

15 Karl Marx y Friedrich Engels, *Manifiesto comunista* (Madrid: Alianza Editorial, 2001).

at this particular case?

F.S. Well, this is a very interesting question and basically it shows us that a theory of human history is still lacking. I think that the sociology of Norbert Elias offers a very interesting way of thinking, but it has not yet sufficiently been elaborated, it is a task we need to do. I have been working on that, and David Christian also wanted to do that with his collective learning. But what is lacking is a theory that offers a general framework for understanding historical changes. But, yes, it is really necessary to add such a theory to the perspective of Big History, I completely agree.

I.G. From the point of view of Big History, would the subject of learning be a fundamental part of such a theory? Should it be one of the pillars of the theory that is needed? Possibly Elias' use of the term psychogenesis could be integrated into it as well.

F.S. Yes, I think so. What you see with Elias, this emphasis on learning, it is not really prevalent in his theory: he talks more about changes in behavior, that are also forms of learning, but he doesn't have much of an elaborated theory on this matter. It is possible to incorporate it, I think so, but is has not yet happened. I think we need to combine this idea of learning with his theory, but also forgetting, the combination of those two processes with structures of power, with interdependencies and skills of the societies involved, this is what is at stake in this approach.

I.G. You have already broken down some of the reasons why Big History has not yet landed in Latin America, could you elaborate on this a little more? Why do you think this perspective has not generated so much strength?

F.S. Yes, sure. Right now, I am studying Spanish cosmology, I don't know if you have heard about this, I didn't know much about it. For example, I realized while studying the history of Peru that there had been cosmologists such as José de Acosta, who wrote the book *Natural and Moral History of the Indies* (at that time, moral history meant human history); now I am reading a book called *Secret Science: Spanish Cosmography and The New World,"*[16] which was published in the United States. What the Spaniards did when they began dominating Latin America was to gather information, create images, that allowed them control of the maritime routes. They looked for a lot of information and sent it to Spain. There they constructed large images of the heavens and the Earth, their characteristics, their resources, the inhabitants, and they called it cosmography, but they did this in secret because they didn't want anyone else to know. In the colonies, they didn't have these more complete and general images, but in Spain they did. The Dutch managed to get hold of some of that as well, which is how it was possible for me to buy a map of Peru from 1640 in Amsterdam which indicated the place where I did my research, *Xaquixaguana* in Quechua, while when I was in Peru I could not buy or even find such an ancient map. Moreover, there was information available from which such a map could be made, but not Peru but rather in Spain. This happened in Colombia, too.

Colonization left the colonized peoples in a dependent position, and that explains why there is not a tradition of cosmography in Latin America while there was one in Spain. This condition of a monopoly on this knowledge may also explain why there is an interest in Big History in Spain, I think, much like there is a tradition of cosmography in Holland. I think you (in Latin America) still have that disadvantage, in that sense, it's still a colonial heritage. We have to put up a fight to make people aware of this, because we need to overcome it. Overcoming this disadvantage will possibly take generations, however if there is more awareness, it will be easier to overcome. I am thinking about writing on this subject, and it would be interesting if in each country of Latin America such a history was written in these terms. There is an excellent historian from Colombia, Antonio Vélez,

16 María M. Portuondo, *Secret Science: Spanish Cosmography and the New World*, (2013). Chicago, University of Chicago Press.

who could write such a story.[17]

I.G. As our one of final questions, we would like to ask you about the projects you have in mind for the future.

F.S. I already talked about writing about this idea of ancient cosmography and Big History, which is also found in China in the Daoist tradition. I think that in each country there is at least one person who wants to study Big History. I am also working on the history of plants, bacteria, animals, and how people have used them in their environment.

I.G. There are two ongoing projects in relation to the proposal of Big History at the University of Amsterdam. The first has to do with the little big histories, what do you think is the plan for the future of this approach? What do you think about the project of big river histories, such as the Nalón in Spain?

F.S. I think that this project in Spain has the potential to bring people together in the university, to collaborate. The problem is that there are many subjects that can developed into such little big histories, but this does not mean that they contribute to formulate a more complete and clear theoretical body; this is something that is missing. I am thinking that it might be possible to construct something that could truly contribute to a more general image of Big History. This is my hope. The little big histories don't do much of that right now, although they provide a lot of motivation to the students.

I.G. The second project, along the same line, are the courses offered in Coursera, the MOOC educational platforms, and the educational commitment of Big History to schools in the Netherlands, the United States, Australia, and South Korea. The virtual media, through the internet, allow the ideas of Big History to reach a wider audience, and you at the University of Amsterdam have just launched a course of this kind. What are the expectations for those courses and for those educational platforms in the future?

F.S. Well, in relation to expectations we will see what the numbers are of the people who will take it, but there is also a political aspect: for the University of Amsterdam it is important to show that it can produce international courses, for that reason we have obtained financing. For the bureaucratic system this is important, and we are always in a struggle for resources, which are defined by the number of people who take the courses. I'm not sure what is going to happen, it's impossible to predict, we'll see. I hope that these courses will also be taught in other languages, obviously in Spanish. Maybe you could start one.

I.G. As we told you, we are just beginning to meet, discuss, while doing a few projects together, and we hope that we can also continue with the initiative, as a group, to talk about topics of Big History, informing each other, reaching out, etc.

When we did our explorative sessions to create the bulk of the questions, we also reached a conclusion: what you are attempting to propose as Big History seemed very different to us from what we had seen in the discipline: you offer more trends and patterns, explanations rather than just a description of what had occurred, which is what has traditionally been done. In this sense, for us this has been a complete novelty, and that is why we also think that it is extremely valuable to start talking about these themes here in our country.

Thank you very much for this conversation.

Conclusion

As shown throughout the interview, Fred Spier seeks to explore, through Big History, the lengthy process that unites our history with natural history: using energy density as a methodological resource to understand how our present and past connects us with the history of the entire universe, with the most basic principles in which the emergence of authentic novelties such as stars and galaxies took place. On the other hand, it also clarifies the urgent need for a revolution in the use of energy and describes the dramatic ecological situation in which we have arrived today. In this context, the possibility of peaceful coexistence among the members of our species is nourished by a new dimension which puts

17 Antonio Vélez Montoya, *Del big bang al homo sapiens*. (Bogotá: Villegas Editores, 2004). However, the first editions of his book were published already in the 1990s.

into perspective local differences in the use of energy (measured in terms of the control of natural resources and technological possibilities) as well as its impact on global relations.

In its approach, Big History opens new possibilities to answer some of the most relevant questions for humanity, for example: the future of ecological sustainability. It is a story addressed to all members of our species, regardless of nationality of those who are interested in understanding it. For that reason, it is still a project with an open agenda, whose main objective is to build a more realistic image of the world and its history.

On the other hand, Big History offers a new point of view to reflect on our situation: given that the magnitude of the human impact on Earth has been much faster than at any previous historical moment, it is necessary to be aware of the increase in the levels of entropy that humans have caused on Earth. Only from this awareness can we assess from a more detached perspective the creative and destructive potential of the different forms of organization in which we have lived and, eventually, look for a way that leads to the future of the human species towards a more ecological, peaceful, and sustainable course.

For Fred Spier, the arguments that Big History offers are not simple rhetoric but are derived from two fundamental pillars: observation and interpretation. This is intended to control ideological views that can blind us to the greatest problems of humanity -such as climate change- or maintain harmful social systems that pretend to solve current problems through obsolete solutions such as industrial or totalitarian modes of production. In this way, Big History constitutes a cluster of observations that demystify rhetorical opinions, one of the aims for which it uses its investigative power.

In the interview it is apparent that there is a necessity to integrate in the perspective of Big History with the most advanced insights that researchers of the theory of knowledge and learning have reached so far. In this a way, a new field is opened up for exploring the complexity of the history of human culture within its different forms of social organization.

Big History is far from being a closed and complete theory: it is a perspective open to research, based on very solid observations at the theoretical level and with a still very large agenda to explore. It is only the beginning. From Latin America, what could we contribute?

The New Story, the Biggest Picture, and a Little Big History of Flight: A Review of Books by Wendy Curtis

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We look outward and marvel at the expansive beauty of the heavens. We evolved within an evolving Universe. We quest to understand it.
– The Biggest Picture (2016)

Perhaps people have always dreamed of flying as they watched birds and other animals glide and soar through the sky.
– Big History in Flight (2018)

Three decades ago this year, in *The Dream of the Earth* (1988), Thomas Berry wrote, "It's all a question of story. We are in trouble now because we do not have a good story. We are in between stories. The old story, the account of how the world came to be and how we fit into it, is no longer effective. Yet we have not learned the new story." From the rest of the volume where his essay, "The New Story," appeared, it is clear that Berry meant the story of the Earth in the context of the larger story of the cosmos, the story of humanity in the context of geology and ecology, and the duty of the American college to place the story of humans into the largest possible narrative available.

In the summer of 2011 the 20th World History Association (WHA) conference in Beijing included a series of sessions on "big history." The idea was in the air; a decision had been made the previous summer to form an organization, but it was still in the planning stages. Floating on a lake near the Emperor's Summer Palace in Beijing, I sat beside a woman who was one of the most informed, obviously a member of the inner circle of session organizers. I asked her, "Before David Christian coined the term 'big history,' where did it begin? Who first understood the narrative we now call Big History?" Without hesitation, Cynthia Stokes Brown, author of a foundational book on Big History, said, "Thomas Berry." I asked her what he wrote. "*The Dream of the Earth*," she answered. "That's probably where the seeds of the Big History movement were sowed." Back in the United States, I researched Thomas Berry and discovered that he and Brian Swimme had co-written a book called *The Universe Story*, the same year (1988) that Berry had published *The Dream of the Earth*. His remark referring to "the new story" at the beginning of this review was now clear. Moreover, the underlying meaning of Big History was also clear. Big History is Thomas Berry's New Story.

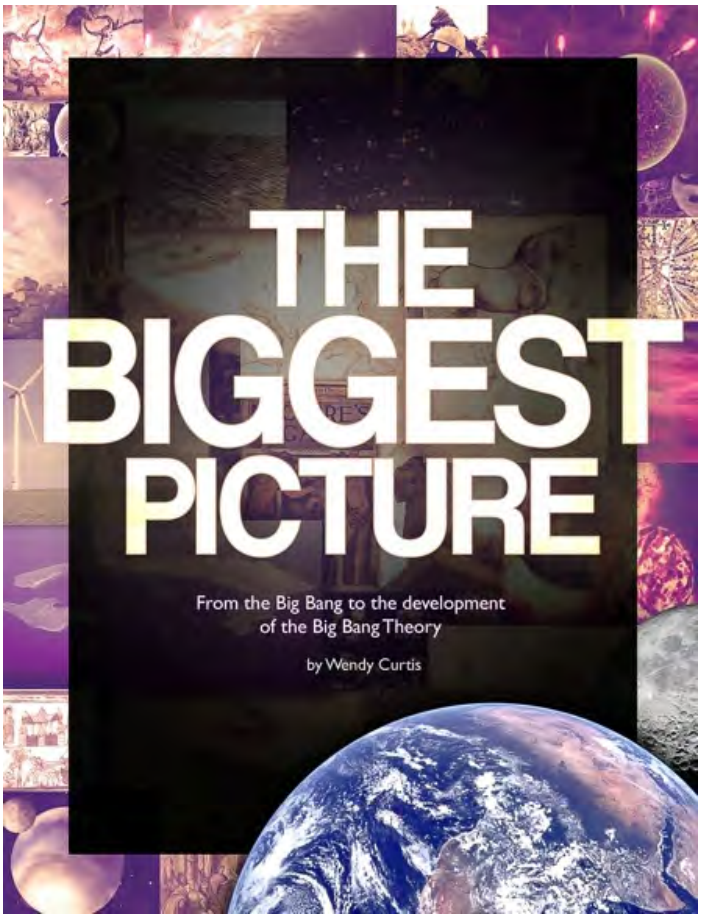
The earliest group photograph of Big Historians, taken in 2010 at the site of the KT boundary in Gubio, Italy, pictures seven mature scholars, all holders of doctorates in a variety of fields—anthropology, education, geography, geology, history, and political science. The photo is emblematic of what IBHA looked like in its early years—an eclectic, academic, university centered organization with a primary mark of success being the successful introduction of a Big History course at one's home university. These seven

had done it. We should all take up the challenge, and it has been a challenge, as everyone has discovered because no university has a department of Big History, traditional historians do not think history extends earlier than human records, most academics do not appreciate the importance of what big historians are doing, the majority show little interest in expanding their expertise beyond their field of specialization carved out in graduate school, and university administrators put up barriers against what they don't understand.

Consistent with the assumptions of the founders, the 2012 and 2014 IBHA conferences included a strong emphasis on developing a research program which was deemed a requirement for establishing Big History as a serious academic field. But then several unexpected developments added new dimensions. One was the installation of the six-hour Freshman Experience at Dominican University where the 2014 conference was held—an impressive introduction of Big History on an American campus— which required a rapid pedagogical startup for nearly twenty academics who were new to Big History. A second was the rapid development of the Big History Project, a free online course for high schoolers that similarly shifted the emphasis to pedagogy. Third, presentations by and Michael and D'Neil Duffy at the early IBHA conferences made clear how the Montessori Method had been introducing something like Big History at the elementary school level for more than half a century. Such developments in the direction of teaching continue. The second volume of the three-volume anthology, *From the Big Bang to Galactic Civilizations* (2015-2017) focuses on "education and understanding." At the time of this writing a new syllabus from the Big History Institute at Macquarie University is soon to be released; it will include an introduction to Big History at the grade school level. These developments tell us that Big History has broadened its perspective over the past eight years. The major books by Fred Spier, David Christian, Cynthia Stokes Brown, and Walter Alvarez still have the format of the academic treatise, and the Christian-Brown-Benjamin textbook has confirmed the university-course orientation of the founders: *Big History: Between Nothing and Everything* (2014) resembles standard freshman-sophomore textbooks in required history or political science courses. Undoubtedly this is what McGraw Hill wanted to produce—a text that would look like a standard course text rather than one of the most innovative presentations in the university curricula. The *Journal of Big History* still has an academic, research oriented profile, so far with little in the direction of syllabus expansion. Working out the numerous educational levels Big History needs to address is a work in progress.

It is against this background that heavily pictorial books should be viewed. The most prominent is the oversized coffee-table book. *Big History* (2016) published by DK—copiously illustrated in full color, replete with maps and diagrams, and text closely linked to illustrations. With a Foreword by David Christian, this weighty volume is a professionally produced book with a design we've seen in a dozen earlier DK volumes. I like it, and in fact I have assigned it in my *Cosmic Narratives* course at University of Houston for the past two semesters. I advise students to leave it open on the coffee table, turn over one page each day, and read the two-page spread. This will keep them abreast of what goes on in the class and they will get through most of the volume over a 15-seeks semester. I also point out that his is not a "textbook" to trade in for pennies on the dollar but rather a permanent keeper for a home library that they will feel called upon to open up again over the years. While I have assigned other texts in former semesters, I'm never convinced that today's students get very far through any primarily-print texts. My feeling is that the DK volume works as well as any—among today's text-shy, visually-oriented millennials.

There is, however, plenty of room for a similar approach that is even more accessible than the DK volume. Wendy Curtis deserves attention for moving beyond the academic treatises of the early founders



by producing a more user-friendly pictorial version of Big History. Her book, *The Biggest Picture* (2016) accomplishes this, and two awards—the Readers' Favorite Book Award and Independent Publisher Book Award—verify the accomplishment. Essentially, she retells the New Story of Cosmos, Earth, Life, and Humanity central to Big History.

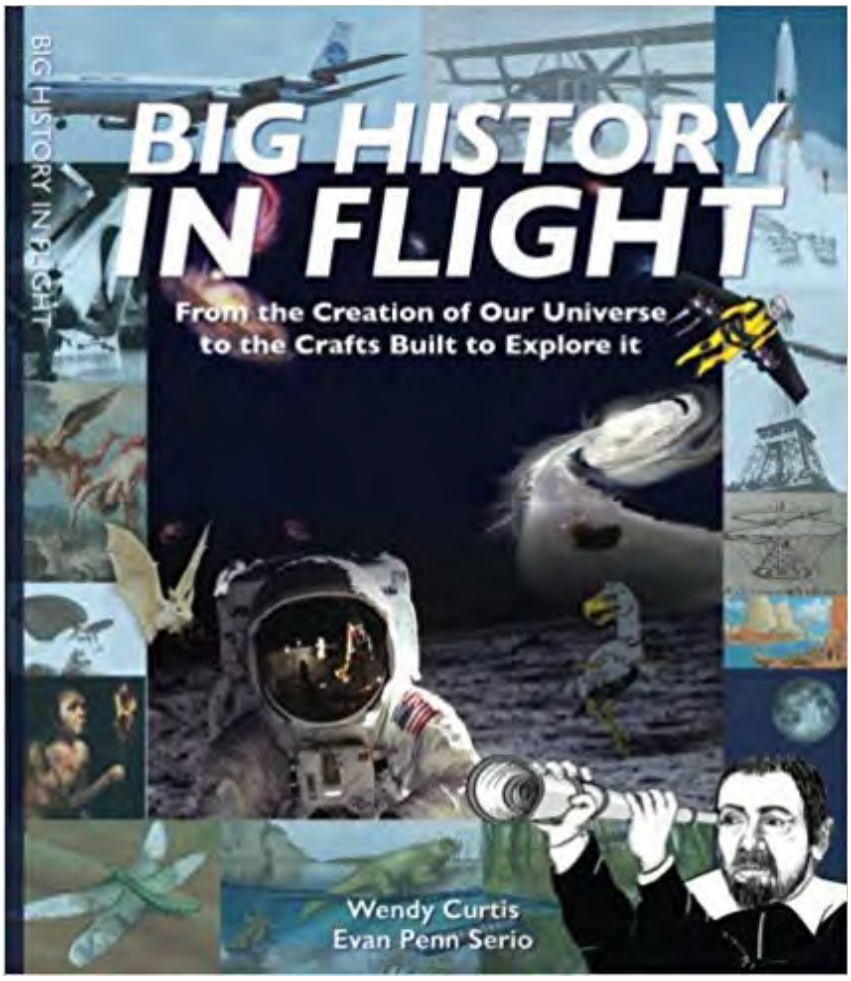
I picked up this book and its companion volume, *Big History in Flight* (2018), at the 4th IBHA conference in July 2018 at Villanova University. In format, it's a paperback but has no resemblance to previous Big History books or to a college textbook. In this version of the new story, we plunge in directly, with the opening limited to title and contents pages. There is no preface or prologue, no formal, grandiose introduction signed by the author; instead, we find a few paragraphs against a starlit sky crossed by the Milky Way that introduces the story as a quest for understanding, a search for origins. The initial impression of the book is of brilliant color. The book is a potpourri of illustrations, some painted, many incorporated from image banks with due acknowledgement of sources. A different color is used for the page edges of its 20 chapters and the colors chosen are bright—flame red, royal blue, forest green, tangerine, etc. Opening the book, one discovers edge-to-edge color with very few pages of print against a white background. Treatment is colorfully expansive rather than boxed between traditional margins. Curtis has chosen the format she wanted rather than one imposed by a publisher; the result looks like the kind of book today's student will want to explore.

The Biggest Picture begins with a fiery expansion, bouncing particles, the big-bang beginning of things, and it proceeds through the 13.8 billion-year history of the Cosmos, Earth, Life, Humanity, and History all the way to the launching of telescopes and genetic analysis that make Big History possible. Footnotes and references to books in the text are avoided, resulting in a clean presentation; following a trend made possible by electronic storage, notes and footnotes to the volume are available on the backup website—*www.GeobookStudio.org*. However, a compact and impressive bibliography of around 100 articles and books at the end establishes Wendy Curtis as a thorough researcher and her text as founded on the best that modern science has to offer.

In light of our earlier discussion, *The Biggest Picture* seems ready made for the upper high school student, perhaps as a supplement to the online Big History Project. The images chosen, some borrowed, some artistically rendered for this volume, are explained with clearly written text that never sinks into jargon or obscure scientific theory. The book falls into three sections. The first (Chapters 1 to 6) is largely focused on the cosmic prologue, bring us up to the formation of the Earth. The second (Chapters 7 to 14) covers life on Earth and human emergence up to the development of religion. The third (Chapters 15 to 20) focuses on recent history since the rise of Europe as a colonial

power. Appropriately, the ratio of text to illustration increases in the third section though every pair of facing pages includes some kind of diagram, map, or illustration.

Curtis has an interesting background. As a high school dropout, she had a break in her education, but later completed a degree at Smith College. Her Geology major informs The Biggest Picture at many points. Chapter 5, "Building the Planets," starts out with three paintings of orbiting planetesimals through stages of planetary accretion, a sequence of original illustrations for what is usually simply described. The early Earth, formation of its core and the Moon, and the hardening of the crust of both Earth and the Moon, the development of granite, and emergence of proto-planets are given appropriate space. In Chapter 8, the assembly of the supercontinent Rodinia is treated, a rare topic of discussion; the usual treatment of continental drift and plate tectonics begins with the breakup of Pangea 200 million years ago. But going back a billion years to this earlier supercontinent allows Curtis to discuss the supercontinent cycle and also the Grenville Mountains created by craton collision and their descendants, the American Adirondacks. The flooding of the center of the proto-continent, North America, is pictured—a geological episode responsible for the vast coal reserves of the Midwest and the proliferation of fossils of swamp-dwelling dinosaurs throughout the same region.



Chapter 10 treats the breakup of Pangea in equal detail with dramatic pictures of Africa and India moving north toward a collision with Asia and the resulting crash site—the Himalayas. Woven through this is the demise of the dinosaurs and emergence of primates, survivors of the asteroid strike 65 million years ago. The gigantic explosion of Mount Toba on Sumatra, perhaps the greatest explosion of prehistory, is pictured, along with a resultant genetic bottleneck during the peopling of the Earth—an interesting connection between geological events and human evolution. With the treatment of Beringia, the land bridge from Siberia to Alaska 20,000 years ago, the dramatic phase of human migration into the Americas is complete. Beringia was the last geological feature that shaped the migration history of humans during the peopling of the world. Thereafter, ocean currents and climate change govern human life, affecting the timing of the agricultural revolution, the to-and-fro of human settlement, trade, imperial conquest, and the rise and fall of civilizations.

In most treatments of Big History, Hubble's observation of an expanding Universe, the evolution of elements in the stars, and the discovery of the Cosmic Microwave Background (CMB) are treated near the

beginning of the story as proofs for the Big Bang and stellar evolution. Curtis has chosen to place these within the events of modern history, thus clarifying the actual chronology of scientific discovery. She has also chosen to bring her treatment of history right up to date with treatment of the atomic bomb, the development of the Interstate Highway System, the fall of the Soviet Union, the attack of 9/11, and some aspects of the flawed democracy of the United States. The fact that she manages all this in a book just three-quarters of an inch thick is testament to careful selection and the value of *The Biggest Picture* as an introduction to Big History.

Curtis has followed up on her initial success with a second volume, *Big history in Flight* (June 2018), a collaboration with Evan Penn Serio who worked with her on *The Biggest Picture*. It too has earned an Independent Publisher Book Award. Along with her first book, this one has the potential of reaching a very wide audience, particularly of young people, for both develop around the New Story arranged as a carefully designed visual narrative, a necessity we are coming to discover. The industrial-strength 100-thousand-word book with minimal illustration has little effect on today's millennials.

In this second book, the Big History extra-terrestrial context and background—Cosmos and Earth—are condensed into three out of fifteen chapters. Chapter 4 introduces the theme of flight with the emergence of flying insects 320 million years ago. Curtis remarks that winged insects of the Pterygota subclass are "now the most species-rich group of insects on Earth (around 60% of all described species)"; almost immediately she draws attention to the Griffinfly, ancestral to modern dragonflies, which appears in the fossil record 290 million years ago. However flight was independently developed in the line of vertebrates beginning with Pterosaurs of the dinosaur era. With the development of feathers, modern birds evolved with flight providing world-wide dispersal into a huge variety of environments. The result was unusually rapid bird speciation.

With flight appearing with many variations—including flying fish and gliding mammals—the buoyancy of Earth's atmosphere was clear to observant humans. The first sentence in *Big History and Flight* provides the theme: "Before we could fly, we dreamed of flying." The second half of the book follows the development of flight from the first hot-air balloon flight in 1783 to the development of powered flight in 1903 and the rapid innovations of passenger planes, war planes, and jet-powered aircraft toward the end of World War Two.

Chapter 9, "Explorers Embark," provides a context that links the explorers of the Age of Discovery with explorers of the sky, a context that Stephen Pyne used in *Voyager: Seeking Newer Worlds in the Third Great Age of Discovery* (2010), a work that presented the Voyager expeditions that began in 1977 as an inspiring adventure of human imagination and ingenuity akin to the discovery of the New World and the circumnavigation of the globe. Curtis' use of this analogy adds a similar imaginative dimension to her story. The following chapter, "Humans Take to the Sky," ranges from mid-19th century plans for steam-powered airships to take prospectors from New York to Gold Rush country in California (this airship was never built) to a surprising number of pre-flight experiments with balloons, gliders, and wings.

Curtis' meticulous coverage of details of flight from insects and birds to powered aircraft over the past century defines this book as a Little Big History of Flight, though "little" hardly does justice to the lore of flight she has assembled. The final ninety pages, including more than 300 illustrations and photographs, provide a fascinating history of flight enriched with anecdotes of the first trans-Atlantic flights, World War 2 bombings, high-altitude spy planes, the development of aircraft carriers, and the little-known fact that the Empire State Building was designed with a mooring mast for airships.

The connotations of "flight" tend to evoke the conventional airplane—everything from hang gliders and Cessna 152s to B52 Flying Fortresses and

Stealth Bombers. Flight seems to imply riding on the buoyancy of the atmosphere made possible by wings and the Bernoulli Effect. But flight has expanded beyond reliance on the atmosphere. Through the sheer power of the jet engine, we can now put satellites into orbit without the support of wings, lofting humans to the Moon, placing telescopes at balance points for observing deep space, and sending exploratory missions to every planet, numerous moons, and asteroids of the Solar System.

A Little Big History of Flight emphasizes an interesting theme and pattern of the New Story. The triumph of flight in the *Voyager* missions has now extended human exploration into the interstellar space of the Milky Way. While insignificant beside stars the size of Sirius or Vega or our own Sun, the *Voyager* space crafts are a triumph of human enterprise, but in terms of flight they constitute additions to the billions of objects flying in the realm of the stars. Recognizing this, it must dawn on us that the entire Universe is in flight—speeding galaxies, circling stars, orbiting planets, moons, and careening asteroids with our own squadron of orbiting satellites symbolizing the dream of human flight come true. Flight is in fact the motional ground plan of everything in the Universe. Our human versions are thus metaphors for what has been going on across the Universe from the moment the first particles were put to flight from the initial singularity where it all began 13.8 billion years ago.

From Ghoonghat to De Beauvoir: Finding a Feminist Voice through Ethnography

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Abstract

Questions of identity are central to anthropological studies. Likewise, the use of self-narrative as a resource has widened the scope for ethnographic research, becoming a form of participant-observer study. The author produces a narrative of the experiences of women in Marwadi communities in western India. The narrative examines the relationship between culture and identity for the purpose of achieving greater self-awareness. It explores the concept of veiling as a discriminatory practice and uses it as a metaphor for understanding wider gender issues. The study draws upon primary sources, such as oral history. Since memory is an important resource but is also selective in its veracity, the author supplements it with secondary sources that reflect on the dichotomy between communities, individuals, and gender. The central purpose of this personal ethnography is to understand the implications of ancestry and develop voice in the larger process of identification of oneself as a feminist.

Keywords

Self-narrative, culture, identity, gender, Marwadi, western India, ancestry, personal ethnography, feminist.

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An understanding of the notion of *self* is a task that calls for story-telling. The organizing of experiences into narrative helps us to develop identity, but it also demands reflection that leads to self-awareness. One's self is not just an entity but is actually a process that orchestrates personal experience into a storyline, an ongoing dialectic of experiences.

A woman's *self* is a gendered phenomenon premised on experiential identity. The secondary status of women in society can be observed in particular cultural settings, from cultural practices and gendered conceptions to symbols of female subordination.[1] Even though the role of women in a society and their relative power vary in different traditions and times, understanding their position as 'the Other' is essential to develop the notion of the *self*.

A key aspect of the subordination of women is the assumption of patriarchal society being the 'natural order of things'. While ideas of self and identity stem from cultural beliefs, attributed reasoning for gender roles claim the inferiority of women to be a product of *nature*. This attribution is especially true in the context of gender and sexuality, where, for example, ideas about homosexuality have been characterized by traditionalists as 'un-natural'. In this way, such claims give a seemingly scientific veneer to cultural bias.

Big historians Nobuo Tsujimura and Hirofumi Katayama propose that scholars adopt a more holistic approach.[2] This implies that we need to break out

of categorical and fragmented thinking to achieve a larger reality. It includes the understanding of our world beyond anthropocentric ways. By understanding gender as a phenomenon in human societies and the animal kingdom, I seek to transcend categorical thinking as characterised by religions, politics and cultures, so as to bring to the forefront an awareness of connectivity.

This is more than just an academic concern. I belong to the Marwadi ethnic group in India, so my objective is also to explore the formation of my own identity as a feminist by investigating the gendered practices of our community. Through an analysis of the practice of veiling as a metaphor for seclusion and subjugation among the Marwadi, I aim to understand the social complexity of larger gendered phenomenon and contest the basis of its universal and seemingly natural logic.

Darwinian Evolution:
From Biological Differences to the Gender Binary

Beyond traditionalist forms of gender inequality, Darwin's theory of evolution contributed to relegating women to an inferior position in society. It provided a seemingly scientific and rational account of women's roles, such that 'natural' differences between males and females were seen to be the result of evolution, in a process that rendered males biologically and intellectually superior.[3]

The concept of female inferiority was a direct outcome of Darwin's model of sexual selection, which lies at the centre of his evolutionary theory. Darwin stated that, in the process of mating, males actively compete to prove their intellectual and physical superiority, while females are just passive recipients. Therefore, sexual selection worked on two levels – the competition between males to pass on the fittest genes and the female choice of a mate. In Darwin's conceptualization, sexual selection is the struggle of active males for the possession of passive females.

The biological differences between males and females in a binary scheme of inferior and superior categories also appeared in Darwin's discussion of anthropomorphic models in *The Descent of Man*. He asserted that 'savages', who were said to possess smaller brains and whose lives were dominated by instinct rather than reason, were at a similar level as women. This extension was premised on the argument that women's power of intuition and rapid perception were characteristics of lower races.[4] The later-evolved gap between male and female in 'civilized' societies led some scientists to classify the sexes as two distinctive 'psychological species', males as *homo frontalis* and females as *homo parietalis*.[5]

Darwin's extrapolation of biological differences into differences of social power-dynamics led to a binary understanding of gender that compartmentalised males as the epitome of intellectual and physical strength and females as sexually coy, submissive, and docile. The concepts concluded that males and females obey universal templates and that deviations from these templates are abnormal. Moving from his discussion of peacocks to people, Darwin concluded that equality was a scientific impossibility, due to the naturally disadvantaged position occupied by females.

Over the years, researchers have come to see that this sexual selection model is inadequate for addressing real-world animal diversity. They point out that Darwin erroneously extrapolated his observations of particular species to formulate universal gendered norms and that it is necessary to place his understanding of sexual selection and its social impact on gender within the contextual framework of the Victorian era. For example, his view of the power dynamics between males and females stemmed from biological determinism, which Victorians tended to see as an inescapable outcome of nature. Darwin's model of sexual selection became so influential that scientists of his day considered the opposing literature to be of minor importance. However, many academics today challenge his model by asserting that it stemmed from his existing binary understanding of gender. The absence of counter examples in his theory not only neglected real world animal diversity, but also

indicated a tendency to focus solely on the instances that substantiated his thesis. As a result, his research is not only charged with confirmation bias, but is also criticized for compounding the gender problem.[6]

A lot of more detailed and wider-ranging research has been done since the time of Darwin, including on the varieties of gender expression. A primary assumption that has been challenged is the belief that an organism is solely male or female for life. Modern researchers have shown that the most common body form among plants and half of the animal kingdom is for an individual to be both male and female, at least at different points in their life cycle. In alligators and crocodiles, as well as for some turtles and lizards, sex is determined by the temperature at which eggs are raised. Another antiquated assumption was that only females give birth. In some species, however, females deposit eggs in the pouch of the male, who incubate them until birth. It was also a commonly held view that males have XY chromosomes, while females have XX. In birds, the reverse is true, and, in others, males and females have no difference in chromosomes.

Other mistaken notions included the existence of only two genders, corresponding to two sexes, such that males have penises, females lactate, and males control females. Research has since shown the existence of three or more genders, with organs of each sex that have the ability to occur in two or more forms. In the spotted hyena, females have a penis-like structure, while, for the fruit bat of Malaysia and Borneo, males have lactating mammary glands. In other species, females control males and the mating interaction – the notion of female passivity and male superiority is reversed. Moreover, there are species in which females do not prefer a dominant male and, often, lifelong monogamy for both sexes is rare.[7]

These assumptions have led to a gender binary that assumes the qualities that define male and female are compartmentalized, innate, and based entirely on their sex. Not only are these beliefs inconsistent with real-world diversity, but exceptions or outliers that ought to have been excluded have been presented as a norm. While Darwin may not have foreseen the influence of his scientific work on society, his theory of sexual selection and beliefs about gender has had a significant impact on society.[8]

Gender dynamics also impacted the way in which women conceived of their own identity. Some women identified themselves as a lower order, compared to men, and believed these qualities to be innate. This implied that women themselves conformed to the idea that education and greater political representation could do little to modify their *innate* nature. Some stated they were better *fitted* to subjects such as chemistry or botany that required 'a capacity for noting details with patience and delicacy.'[9] The common belief upholding the gender binary was that biology, rather than social conditioning, was the primary source of social power-structures. Attributing it to nature validated these beliefs by neglecting the critical influence of culture, family, environment, societal norms, and the fact that, in Darwin's time, few occupational and intellectual opportunities existed for women.

This situation was not looked on as an unfavourable outcome of the gender binary, but instead as a reason for it. One of the major factors that women were defined as the 'other' is because their social role in Darwin's time was largely restricted to childrearing and housekeeping. Constraints on education and employment by law and custom led to erroneous comparisons between male and female abilities.[10] Given the amount of contrasting literature that has emerged since then, it is important to reassess the still existing beliefs concerning gender roles. Even if sexual selection were to operate differently on males and females, males would pass on their apparently superior genes to both sons and daughters. Moreover, the offspring, specifically the male offspring, receive genes from both the parents.[11]

Beyond a modern reassessment of the gender binary in the animal kingdom, human societies and their cultures also need reassessment in respect to the lower values placed on women. The process of *mutualization*, as articulated by Big Historians, is one

that leads to greater awareness of the relationships between human and non-human worlds. This helps us to assess the entirety of our existence and shows the liberating potential of establishing harmonious societies.[12] In that light, I now turn to examine my own community, the *Marwadi* of India, which expresses its own patriarchal power-structure through the practice of *ghoonghat* or veiling.

History of Veiling

The custom of *veiling* encompasses a variety of clothing styles, from headscarves and face veils to all-encompassing face and body garments. Veiling was a political statement denoting the status of an individual in ancient Persian, Mesopotamian, Greco-Roman, and Byzantine civilizations. For Assyrians, veiling had class as well as gender implications: Ancient Assyrian law required veiling for upper-class women but punished commoners for it.[13]

While popular references to veiling are today most often made to Islamic traditions, it also was a custom actively practiced by Christians and Jews – a common tradition of Abrahamic societies. Veils were worn during prayers as a symbol of submission and humility in the presence of God. Various representations of the Virgin Mary show her veiled, and this tradition is cherished by some Catholic nuns today. Moreover, since Roman times, brides have donned veils as a symbol of purity and chastity.

In Islam, veiling as a concept was introduced by the wives of the Prophet Muhammad, who covered their faces to distinguish themselves from other Islamic followers. There are two types of veils recognized in Islam, the *khimar* (headscarf) and the *jilbab* (robe). Although both predated Islam, the *jilbab* connotes respect and status, while also serving as an apparel of modesty and privacy. The practice of veiling gathered momentum after the death of Prophet Mohammed, when Islamic Arab communities wore black or white veils to distinguish themselves from the Christian blues and Jewish yellows.[14] Under the Ottoman Empire in the 17th century, the veil became a symbol of rank and wealth, but women in rural areas were slower to adopt it because it interfered with their work in the fields.

Veiling has deep historical ties across cultural communities. Its historical significance was premised on securing the modesty and sanctity of women, based on religious or cultural notions of gender roles. Veiling is but one of the many cultural practices that are rooted in the patriarchal compartmentalization of gender roles. Another practice, for example, is female genital mutilation, or removal of external female genitalia, most common in Africa, the Middle East, and Asia.[15]

While female genital mutilation is said to have originated with the *pharaohs* in Ancient Egypt, it was also practiced in different parts of Africa, the Philippines, certain tribes in the Upper Amazon, in the Arunta tribe in Australia, as well as by early Romans and Arabs. In various cultures, FGM is known as an initiation and considered to mark a girl's passage to womanhood.[16] In an attempt to curb female sexuality, the practice succeeds by preventing women from indulging in 'illicit sexual activities'. The logic of the practice is thus embedded in notions of purity and chastity inherently associated with womanhood in most cultures.

The maintenance of these patriarchal structures depends greatly on the secondary status of women. Some cultures preserved these practices by embedding them within the logic of mythology, which rationalizes the subjugation of women and manifests itself in even modern-day traditions. Anthropologist Sada Mire writes:

> Some key Somali rituals revolve around fertility and kinship. Hence, in the context of Somali fertility rites, myths are pervasive. The landscape and objects give existence to ancient deities and unite with the suffering of women.[17]

The veil and other such gendered practices are traditions connotative of the underlying status of

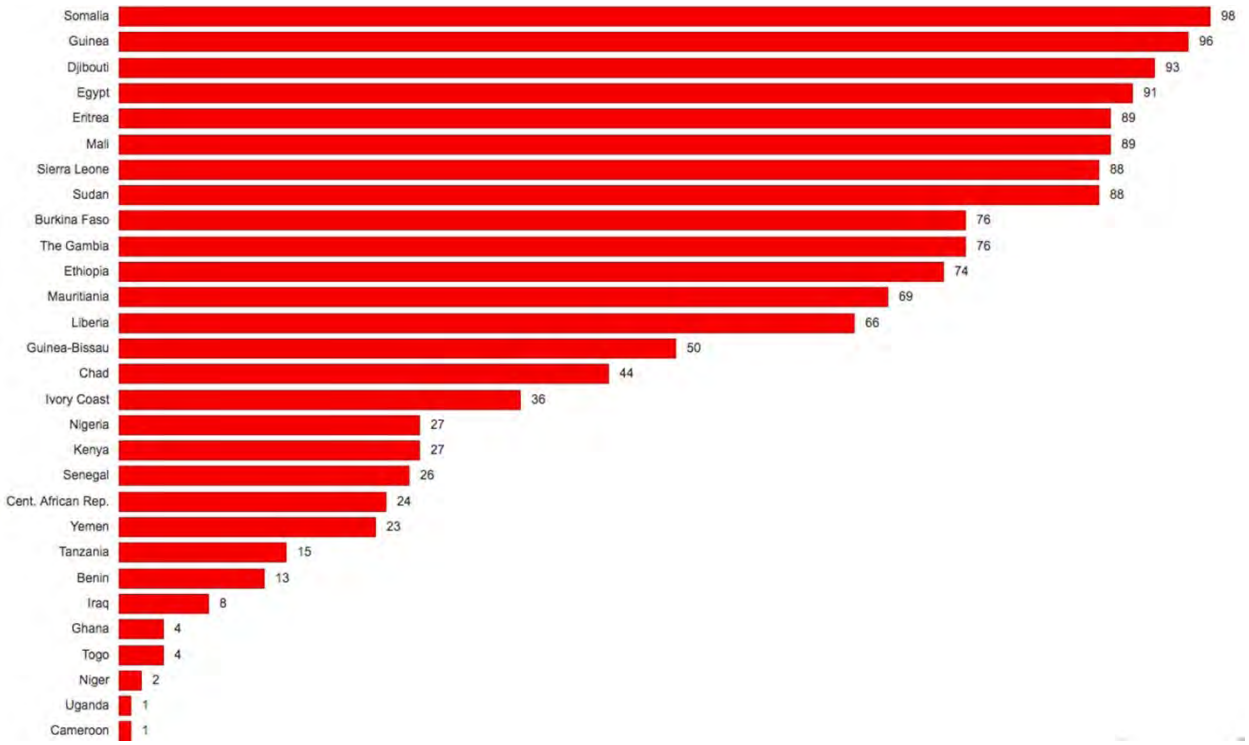

Figure 1: Prevalence of female genital mutilation in different countries.
Source: UNICEF, 2014, reported in Sarah Boseley, 'What is Female Genital Mutilation and Where Does it Happen?', *The Guardian*, 6 February 2014.

females as 'the Other'. In many ways, these practices are cultural artefacts that act as metaphors of seclusion for the female identity.

Movement Away from the Veil

The class and rank connotations of veiling persisted up until the last century, when more privileged women began rejecting the practice, while women belonging to lower classes began adopting it as a symbol of upward mobility. In that light, the movement away from veiling was a socio-economic phenomenon.

Being the drivers of the world order in colonial periods, European and other Western nations prospered significantly, leading to higher standards of living and educational levels. Among the first to reflect on *modernity* and *rationality* vis-à-vis existing traditions, these communities began to question the premise of veiling and identified it as a form of patriarchal seclusion of women from the public sphere. The recognition of the veil as a construct and not a mandate from God further contributed to its decline.

The anti-veiling movement also gained momentum outside of the West. In nineteenth-century Egypt, Qasim Amin, a leader of feminist thought in the Arab world, argued that the veil only served to restrict the productive capacity of women.[18] Late-nineteenth to early-twentieth-century colonial discourse also depicted the repression of women by traditional societies as an example of Western superiority. Shaarawi cast off her veil by calling it the biggest obstacle to women's engagement in public life.[19] These actions were followed by feminists in Lebanon, Syria and Tunisia.

A major decline of veiling came when individuals began to recognize it as a form of gender discrimination. Many also argue that the decline was a side-effect of independence movements. Educator Leila Ahmed contends that, even though gendered practices and

customs such as veiling are an indication of inequality, colonizers used it to further their self-interest and establish Western superiority.[20] She writes:

> When it comes to items of clothing, be it bloomers or bras, clothes have briefly figured as focusses of contention and symbols of feminist struggle in Western societies. It was at least Western feminist women who were responsible for identifying the item in question as significant and defining it as a site of struggle and not, as has sadly been the case with Muslim women, colonial and patriarchal men... who declared it important to the feminist struggle.[21]

In the context of democratization, veiling is seen to be an issue in deciding which values and cultural practices are deemed acceptable to a democratic nation. The simple act of unveiling cannot be considered a movement towards gender equality if it violates a woman's right to choose. What feminists from all over the world are trying to establish is that the decline of the veil comes dangerously close to a colonial and patriarchal agenda. Labelling the practice as unequal on behalf of instead of with the women who practice it can be problematic. Therefore, I try to understand the thoughts and feelings of Marwadi women who wear the veil even today.

Women and the Marwadi Community

The Marwadis are one of the ethno-linguistic communities of India. Originally from Jodhpur, Rajasthan, the Marwadis have come to be associated with other sub-cultures because of their specific job specializations pertaining to commercial and trade.

Marwadi women do not tend to be well educated, compared to women of other ethnic groups, even among wealthier families. If they are exposed to advanced education at all, they are often urged to study subjects like Home Science or Hindi Literature, subjects that would not pave the way for a career outside of the home. Some Marwadi women have creatively taken part in the public sphere, such as volunteer work or running a small business. However, this calculated freedom is based on the idea that it would not shrink the focus on their domestic responsibility. The main duty of a Marwadi woman is to provide a stable household for her husband, sons, fathers, brothers and in-laws – men who dominate the world of business, trade, and the public sector.[22]

Nonetheless, Marwadi women have increasingly obtained higher levels of education and a small percentage of them have achieved a more active part in public life by taking entrepreneurial positions in their family businesses. However, this is done only by not compromising a family's reputation by working for others, which would imply that a family is suffering from financial hardship. Even among these Marwadi female entrepreneurs, it would be hard to find women who identify themselves as feminists. They continue to hold traditional beliefs about gender roles that are at odds with the global feminist movement. One such belief that has managed to sustain itself is the idea of veiling in the Indian context.

Veiling as a Metaphor in the Marwadi Community

The Marwadi custom of *ghoonghat* is a essentially premised on the commodification of women. The *ghoonghat* is a veil worn by a married Hindu woman of the Marwadi. The loose end of the sari or a duppatta (long scarf) is pulled over the head and face of a woman. This acts as a headscarf (*ghoonghat*). Etymologically, the term stems from the Sanskrit term *avagunthana*, meaning to 'cover' or 'hide'. The significance of the *ghoonghat* in is based on the logic of protecting the *laaj* (modesty, honor and shame) of a woman.

During marriage rituals, a bride wears the *ghoonghat*, which is provided by both her parents and her in-laws as a symbol of trading one family's protection to another. A post-wedding ceremony then introduces the bride to her new family and uses the custom of *ghoonghat* to perpetuate restrictive ideas of gender. As each family member lifts the *ghoonghat* of the bride,

she is rewarded for her beauty. Additionally, the bride continues to wear the *ghoonghat* as a form of showing respect to her in-laws.

Image 1: Rashmi Mathur (the author's mother) wearing a *ghoonghat* at her wedding, Jodhpur, Rajasthan, 6 October 1996.

Source: Rashmi Mathur wedding album.

Image 2: Marwadi women (author's aunts) at the wedding, Jodhpur, Rajasthan, 6 October 1996.
Source: Rashmi and Ajay Mathur wedding album.

In Marwadi communities, physical space and gender are linked in everyday life. The practice of veiling has contributed to the designation of urban and ritual spaces as not only being public or private but also as social zones for gendered interaction. It is important to understand the intricacies of these compartmentalized domains, as they provide a framework for constructing and facilitating gender roles.

For instance, Marwadi women observe the *ghoonghat* predominantly in the house of their in-laws. These include the mother-in-law, father-in-law, and other older male and female relatives of her husband. In extreme cases, 'observing' the *ghoonghat* translates into not being seen at all, resulting in the daughter-in-law hiding behind doors or curtains. The practice of *ghoonghat* does not translate into a mere physical covering of the woman but also dictates her interactions and self-expression.

In complying with the tradition of a *ghoonghat*, the daughter-in-law is also expected to veil her voice. This implies restrictions on the expression of her thoughts and opinions in the presence of her in-laws. In this way, veiling enforces familial hierarchy and female subjugation in the name of 'modesty'. This shows that 'public' and 'private' are not distinctions tied to the nature of the space itself but more to the gendered interaction of kinship. Thus, veiling in Marwadi communities produces a complex sense of space based on a woman's kin relationship to that space.[23]

My mother, Rashmi Mathur, commented upon how changes in kinship after marriage affected her experience of being a woman.[24]

> *Shaadi ke baad sabse zyada farak rok-tok ki wajah se padhta hai. Mein kahin bhi apni saas ko puche bina nahi jaa sakti. Sab in-laws ke saamne ghoonghat mein rehna padhta hai. Zyada bolne aur karne ki bhi aazadi nahi hoti.*
>
> Translation: The one thing that changes the most after marriage is freedom. I can't go anywhere without consulting my mother-in-law. I have to wear a *ghoonghat* in front of all my in-laws. I do not have the freedom to do anything or say anything on my own.

The point she makes is that post-marital kinship destroys her individual freedom. Her actions, desires and mannerisms are dependent on the relationship she

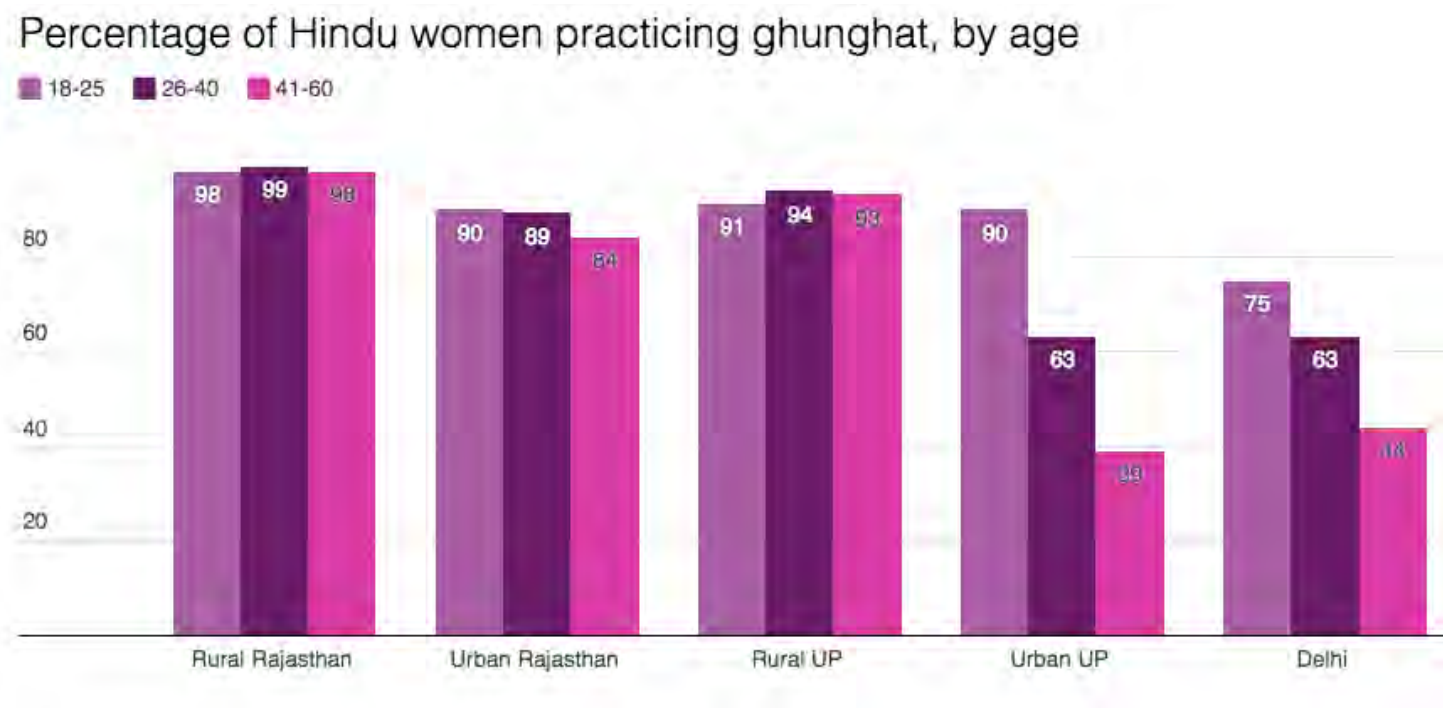

Figure 2: Prevalence of the practice of *ghoonghat*.
Source: Janhavi Sen, 'Understanding Prejudice: The Skewed Way Indians Still Think About Gender and Caste', *The Wire*, 11 January 2018, <https://thewire.in/caste/caste-gender-prejudice-india-inter-caste-marriage>.

has to her in-laws and male counterparts, such as her husband and father-in-law.

She also remarked on the extension of this deference to include males outside the family, a result of the expansion of the patriarchal Rajput community throughout India, including among the Marwadi. A community associated with ideas of warriorhood, the Rajputs ruled several kingdoms in Rajasthan and were army commanders of various rulers in pre-colonial India. This led to the proliferation and amalgamation of their ideas with those of the Marwadi. For instance, instead of the *ghoonghat*, the Rajputs use the notion of *purdah* to seclude women from public and political life. While the *ghoonghat* is an individual veil, *purdah* implies physical demarcation of areas specific for women by using screens, curtains, and even walls.

> *Rajputon ki wajah se bhi bahot farak padha hai. Jaise hi koi male in-law hamare saamne se nikalta tha, humein wahin neeche beth jaana tha respect dikhane ke liye.*
>
> Translation: The Marwadi culture has been impacted by the *Rajputs* insofar as whenever an older male member of the family or male in-law walks by a married Marwadi woman, she is expected to sit down to show respect.

As mentioned, the metaphor of veiling also secludes women from voicing their opinion after marriage. She states:

> *In-laws ke saamne zyada kuch bol nahi sakte. Har baat ko 'Ji hukum' kehke chup ho jaana hota hai. Zyada ghar-karche or kaam ke mamle mein baat karna allowed nahi hota.*
>
> Translation: You have to silence your voice in front of your in-laws and only restrict to responding with the words '*Ji Hukum'* which literally translates to 'Yes Sir.' In terms of property, work and expenditure, women have no say and are compelled to silence their opinions.

The idea of veiling also applies to seclusion of women from everyday family activities. Differential treatment of women during mealtimes is one of them. A Marwadi daughter-in-law is expected to wait until her husband and father-in-law finish their meals before serving herself – the public sphere is therefore defined by the presence of males. As with the practice of *ghoonghat,* this further serves to seclude women. Rashmi Mathur says:

> *Shaadi ke pehle jab marzi ho tak khaana kha sakte the. Lekin shaadi ke baad, sirf saas, sasur, husband aur baaki in-laws ke khaane ke baad hi kha sakte ho.*
>
> Translation: The freedom to eat as you please is taken away after marriage. One can only consume food after all the in-laws and the husband have eaten their share.

The primary understanding is that kinship and marriage are critical to understand how spaces are gendered through veiling.

Patriarchy of the Marwadi Community and Me

My father, Ajay Mathur, and my mother, Rashmi Mathur, both grew up in Jodhpur, Rajasthan. A distinct feature of Marwadi communities is the primacy given to kinship and community, and so they grew up into lives rooted in tradition. However, my father moved to Mumbai for work, and, after they married, they settled in the Goregaon suburb, a modern, middle-class neighborhood. As a result, they lived in a more heterogeneous society and were exposed to ideas not in accordance with tradition. I think the broadening of perspective played a significant role in my own non-traditional upbringing, but this change was not linear. It was gradual … and is still is developing.

Like all children, I was susceptable to the internalizing of gender roles. My mother was never really a full person after she conceived me, as her efforts were reduced to glorifying motherliness as the highest goal of womanhood. I was told that academic achievement was essential for professional success, but I came to understand that this expressed importance of education in a woman's life is only superficial. It was as though me and (by extension) other girls were being polished in school only to have a high cash value in the marriage market. As a result, instead of internalizing gender roles, my family life came to be a source of better understanding the artificial nature of social roles and their potential flexibility.

My relatives would talk about my father in high regard if he ever 'helped' my mother with domestic work. While helpfulness is praiseworthy, the descriptive language of help should be rebuffed if it is solely premised on gender roles. Nevertheless, I was exposed to ideas that assumed domestic work and caregiving to be domains occupied by women alone impacted the way in which I viewed every other woman, especially working women with children.

While growing up, I was always loved a little more, cared for a little more, protected a little more, and appreciated a little more. This tendency of being given 'a little more' was in contrast to my cousins, who were all boys. I do not think I quite understood why this was the case as a child, but I do recall my grandmother mentioning that a girl child must always be treated with special care. Naturally then, when I was 'protected' from playing sports and told to cultivate a more *feminine* hobby like dancing, I thought it was in my best interest, or worse, I thought this is what girls were supposed to do.

The problem with such inherently oppressive ideas of womanhood was that I was perpetually confused about my standing in the system. On one hand, I saw my educated mother willingly compromise her professional growth to be a caregiver, while on the other, I was being praised for my professional aspirations. I was privy to conversations about my future marriage as an ultimate achievement and, while my male cousins were always asked about their career plans, my worth was measured against the number of dishes I could cook. Conditioning girls to aspire to marriage and young boys to professional excellence creates an imbalance from the start. As a result, a

marital relationship is far from ideal because the institution is valued more by one gender than by the other.

By virtue of residing in a cosmopolitan urban space like Mumbai, veiling was a phenomenon that I understood only when visiting our hometown in Jodhpur. My mother observed the *ghoonghat* only in the presence of her in-laws in Marwadi spaces. It was an implicit understanding that veiling was a custom restored in the presence of orthodoxy. Although veiling in the form of *ghoonghat* was never demanded of me, I was expected to 'cover' myself, depending on the nature of the space. This implied that, while I was never veiled in the name of tradition, the idea of 'modesty' was imbibed through restrictions on clothing in the presence orthodox family members. The notion of physically covering a woman's body has resurfaced as a more modern-day clothing restriction in the lives of urban women.

Even though I am not expected to alter my clothes or my voice or forgo agency within the safe space of my immediate family, that is not the case when I travel to places like Jodhpur or Jaipur. The closer I am to the Marwadi community and my extended family, the more I am expected to adhere to traditional ideas of womanhood. This substantiates the idea that the closer the Marwadi communities live, the more complex the gender dynamics are, with little room for independence of women.

Reflection and Analysis

My childhood, pleasant as it was, was filled with contradictory experience, ones sometimes overtly and sometimes subtly sexist. These experiences are characteristic of patriarchal societies all around the world, so I have found anthropologist Sherry Ortner's analysis of gender, nature and culture to be helpful in understanding them. The core argument of her famous article, 'Is Female to Male as Nature is to Culture?' (1972), is that the subjugation of women results from cultural distortions of social institutions.[25]

As Ortner addresses it, *nature* is seen by modern, cosmopolitan society as inferior to *culture*, since nature just passively exists, while culture is humanity's way of transformation. This notion goes back to nineteenth-century biological determinism, discussed earlier in my paper, a notion that resulted in the gender-binary social system. Female physiology has been interpreted by male society to be closer to nature, because of women's greater bodily involvement with reproduction. But, as Ortner notes, differences of 'superior' and 'inferior' only exist within culturally defined value systems; it is human society that has culturally restricted women's social roles and placed limits on their social mobility.

In other words, culture has the capacity to *socialize* views of nature, which it has done to the disadvantage of women. Men have become proprietors of the public sphere – ritual, politics, and regulation. It is not just the bodily processes of women that men have identified as inferior but also the locations in which those processes take place. Female space is negatively compartmentalized, while the male's public sphere is interpreted as a higher, more important form of existence, because of its inter-familial, integrative and universalistic concerns.

The practise of *ghoonghat* is part of this sexist discrimination, since it is based on the gender binary and confines women to a domestic sphere. Marwadi communities restrict women's participation in society through veiling, which controls a woman's ability to participate equally in political life, claim rights to resources, exercise volition, and fulfill their complete agency.

Change and Society

It is important to understand how societies can develop a better understanding of gender roles and gendered cultural practices. When societies began recognizing gender histories, the modalities of power became more evident. Varied degrees of female subjugation exist in every type of structure; gender issues are extremely profound. To be able to tackle this pervasive problem is one of the sentiments shared by visionaries in the field of big history.

In their attempt to pave a more activist path for the

future, Nobuo Tsujimura, Hirofumi Katayama and Barry Rodrigue of the Asian Big History Association encourage individuals to find, reimagine, build and sustain a new reality. This idea has been a driving force for me to reimagine cultural reality and develop my voice, as reflected in their following observation:

> If you don't fit in with the old world, old custom and old roads, you can walk in a new direction where nobody walks. You can find, live and cherish a new reality by yourself.[26]

While the objective of this paper is to assess the underlying logic of subjugation and see the potential for change, it is important to note that change is complex. The subjugation of women is a construct of culture and not a fact of nature, which makes the implications for social change circular. This implies that a different cultural view can only arise out of a different social actuality and vice-versa. Just transforming institutions (voting, quotas, equal pay) will not by themselves change cultural norms. Likewise, just raising consciousness, revising educational material or altering mass-media imagery will not be successful unless there is corresponding institutional change to safeguard and reinforce a changed view.[27]

The two-fold interaction needed to address change for women is well enunciated in Simone de Beauvoir's *The Second Sex* (1949).[28] In it, she argued for changes to social and institutional structures, such as access to equal education, contraception, abortion, and economic freedom. These systemic changes then become a basis for philosophical liberation, when one advocates for freedom and defines its essence. The way in which de Beauvoir established the relationship between structural changes and changes in socialization is a remarkable feminist insight. Structural change devoid of socialization makes women complicit in their own subjugation, due of lack of knowledge and understanding, but socialization without structural change limits self expression.

One of de Beauvoir's important insights lies in understanding the relationship between dependency and inequality. Her focus on providing women with productive labour opportunities and autonomy of work seeks to decrease a woman's dependence and demands that she embrace her freedom of choice. Independence is not just construed as a result of liberation but also as a process that leads to equality.

In this way, I find de Beauvoir's strategies and my proposals for the independence of women are very much in keeping with the commercial heritage and ideals embodied by the Marwadi community, although expanded to include all its members, not just its males. Thus, I am happy to find myself part of an ancestral legacy, but in a modern, transformative way and on a global scale.

Conclusion

Astronaut and physician Roberta Bondar describes a time without any boundaries in her discussion of big history.[29] She describes how the natural environment was understood as interconnected in earlier times. However, in an attempt to sustain and foster more sophisticated societies, human beings developed political boundaries to segregate societies and disciplines. In this process, we lost our connectedness to the natural world. Extrapolating this understanding to the concept of gender, it can be said that the development of boundaries in the form of gender binaries have led us astray from our inherent interconnectedness. Human beings need to revisit our fundamental connection to the natural world so as to eliminate the gender binary. This will not only bring about change in an oppressive cultural system, but also rebuild and deepen our connection with our natural environment.

I have used what big historian Barry Rodrigue calls a 'telescoping perspective'.[30] His vision for big history is one that approaches issues on a micro as well as macro level. Understanding the particular gendered practices in various cultures and doing a microanalysis of gender in the Marwadi community has equipped me with the tools of extrapolating it to a more universal gender problem, indeed a human problem. This connection not only addresses the challenge globally

but also provides an insight into our larger existence.

My aim is not purely academic. I wish to see genuine change. To that end, taking a big history approach has not only rendered my study more holistic and interdisciplinary, but it has created a liberating process. By assessing the deeply engrained roots of female subordination and then re-envisioning its framework led me to emancipatory ideas about ourselves and our identity as a continuum. Therefore, adopting a big history approach leads to an empowering message that deepens the understanding of our relationship with ourselves and our nature.

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