Castes and Trees: Tracing the Link Between European and Mexican Representations of Human Taxonomy

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The authors of this manuscript are interested mainly in meta-scientific studies, particularly in historical reflection on biology. Species in the Age of Discordance being the main theme of this special issue, and taking inspiration from the idea that "biological lineages move through time, space and each other", we find it thought-provoking to show that just as biological lineages have histories, diverse conceptual categories have also been historically constituted. Moreover their visual representations have been discordant at different levels, such as the concepts of species and race. This article presents how the struggle to achieve a human taxonomy in late nineteenth- and early twentieth-century Europe had a fundamental visual component that reflects the discussions and theories that led to important discordances in the racial classification of *Homo sapiens* and in other species of hominins. Using as main visual artifacts the representation of evolutionary trees, the painting of castes, as well as the natural classification tree of the Mexican naturalist Manuel Ortega from 1877, the authors will show on the one hand how European ideas about human species and race in the scientific mainstream were deployed in the very distinctive situations of Mexico. On the other hand, it will be shown that visual culture was fundamental and decisive in establishing and disseminating scientific accounts of species and race, and how both concepts have interacted in the visual characterization of human diversity, both to define it and to restrain it.

Keywords

discordance • visual culture • species • race • evolutionary trees

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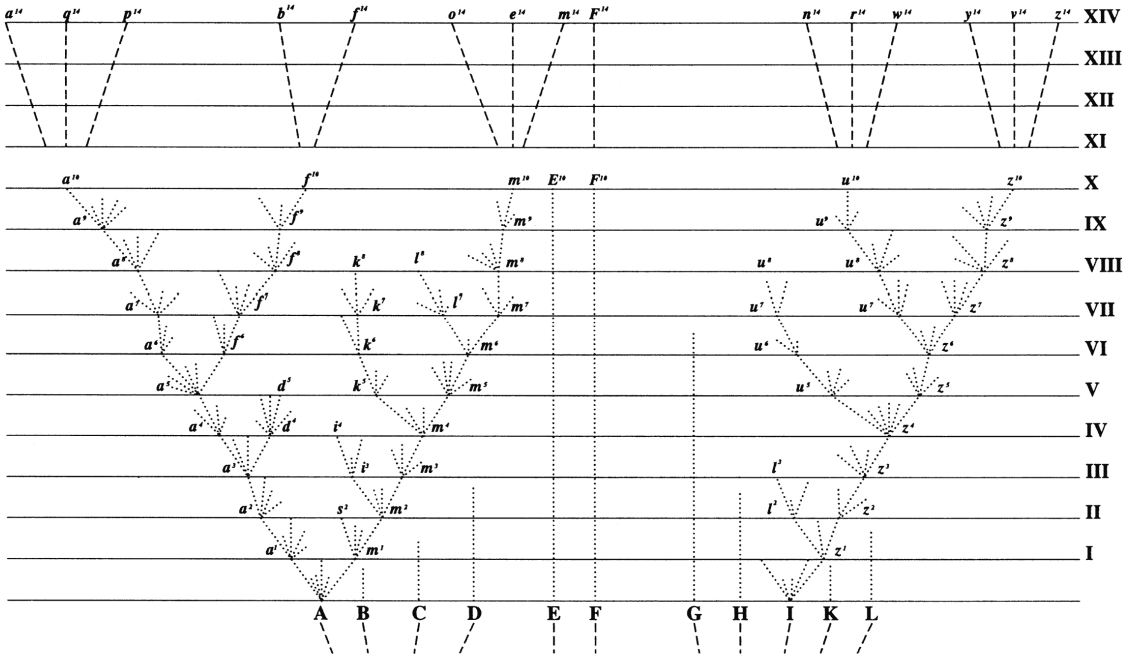

Figure 1: Darwin's Diagram in *On the Origin of Species* (1859)

1 Introduction

Twenty-two years after Charles Darwin began to think of character divergence from a common ancestor in his Notebook B, the now famous and iconic branching diagram appeared in the fourth chapter of *On the Origin of Species* (figure 1).

It took Darwin eleven pages to explain the meaning of the abstract and hypothetical diagram, which does not represent real species but rather the evolutionary process: that natural selection, through the processes of divergence and the way populations of species change over time, can eventually lead to the emergence of new species. It also represents the commonality of ancestry of all species—though Darwin deliberately omitted a single point of origin in his diagram—and that extinction is a natural phenomenon in the evolutionary process.

Darwin included organisms as part of history and took away their status as entities created in their present form, as was commonly thought in the nineteenth century.[1] He managed therefore to integrate, on the one hand, the definition of species as a unit of classification (which involved a synchrony or a noticeable and static dimension), and on the other, the ability of species to evolve over time, involving a diachronic element by projecting species to a temporal dimension. Therefore, the image of the branching lines is not only a symbol of the conceptualization of history in nature, but also a scheme in which time and taxonomy combine, by linking synchronous elements (species on the horizontal axis) to diachronic elements (events in time on the vertical axis) (Weigel 2002).

By this masterpiece, Darwin could resolve several epistemological problems of nineteenth-century biology. He showed that genealogy of species was the bond that naturalists were seeking

1. Before Georges Louis Leclerc, count of Buffon (1707–1788) most of science did not include history, but, in his *Histoire naturelle,* he introduced historical thinking by postulating a long and indeterminate age for our planet, thereby enabling explanations of phenomena such as extinction, which was unthinkable in a world 'created' perfect. This scientific historiography may have influenced Darwin to adopt his genealogical model, with which he revolutionized the study of living things with his concept of a single origin for all species.

in order to achieve a construction of a natural grouping of species—a Natural System. He provided the possibility of linking the consistency between genera and species and their ability to change—which is the necessary condition for their evolution (Weigel 2002)—and provided a real cause, an explanation based on historical evidence, of the origin of diversity by means of the power of uniform accumulation of insignificant changes over vast amounts of time (Gould 2002).

Since then, the idea that genealogy could account for the similarities and differences between organisms began structuring biological thought (Alter 1999). Perception of natural affinities changed from a 'creation plan', known for similarities and differences among species, to that of 'kinship', known for genealogical relationships. After 1859, the achievement of a diagram to represent evolutionary relationships became a major enterprise for many naturalists. Thus, the research of evolutionary relatedness among groups of living beings became one of the practices that dominated much of the inquiry on the organic world around the last decades of the nineteenth century, allowing the disciplines of systematics and biogeography to flourish.

One would think that at present, the problem of documenting not only the diversity of species, but their evolutionary links would be solved given the knowledge from molecular biology, but this is not the case. In the 1960's, molecular evolutionists had high expectations about being able to reconstruct phylogenies using molecular data. However, as several authors in this volume show, these advances in genetics have raised deep problems with lack of consensus on correct phylogenetic classification.

In this regard, another complication is discordance (see Haber 2019 and other contributions to this volume) which represents a profound obstacle to overcome for the precise inference of species phylogenies. This article seeks to contribute to this special issue from the perspective of the history of biology and anthropology. We will borrow the concept of discordance (as in lack of agreement or harmony) and the idea that "biological lineages move through time, space and each other" (Haber 2017) to show that just as biological lineages have history, diverse conceptual categories have also been historically constituted. Two of such conceptual categories are "race" and its visual representation, as well as human species, which have been subject to both biological and historical discordances. In what follows, the authors adopt a historical perspective on two processes linked to particular types of visual representation: the genealogy of theories of scientific racial representation (mainly from Europe) and their visual presentations through the painting of eighteenth-century castes in New Spain, as well as the visualization of a comprehensive classification through the figure of a tree in Mexico named "Synoptic Table of Natural History" and produced by Dr. Manuel Ortega Reyes in 1877.

The close relationship between biology and anthropology has its roots in the early nineteenth century's discourses about the diversity of living beings, but especially in the contrast between human diversity and other living entities (Nott 1843; Prichard 1836; Agassiz 1850; Nott and Gliddon 1854). With the idea of evolution becoming central, the sciences of diversity gradually abandoned the descriptive and classificatory perspective in the nineteenth century, moving forward to a more materialistic explanation of the amount of differences in humans and other living beings. This shift to evolutionary classifications in biology had its parallel in anthropology when trying to assess cultural diversity (Fuentes 2010). Nevertheless, the word "species", born out of the eighteenth century's pre-evolutionary thinking, was used in physical anthropology (or biological anthropology), in its essentialist meaning to appraise human diversity, using "race" as a technical concept to identify "human biotypes". However, this term was loaded with Eurocentric and colonialist judgments of previous centuries (Young 2005). Since then, the use of race as a biological and anthropological category has permeated research that has attempted to identify the differences between human populations as natural kinds. Nonetheless, several authors have

shown that the use of the category of "race" in relation to human diversity is misleading since it embraces social, historical and political considerations (Templeton 2013; Gannett 2014).

2 On the Study of Visual Representation in Science

Since the 1990s there has been a renewed interest within Science and Technology Studies (STS)[2] in the study of scientific representation, to show its relevance not only in the construction of scientific knowledge, but also in its validation process, in its dissemination, and in its teaching. This growing interest in visual images, pioneered by scholars such as Michael Lynch and Steve Woolgar (1988, 1990), generated a series of theoretical and methodological precepts that offered new ways of thinking and writing about the history of science, which allowed (and still allows) illumination of not only science but other human activities, and more importantly, the strong role of visual, scientific representations as vehicles of power and ideology.

Although the concern for scientific images is relatively recent, since traditions from the seventeenth century to the mid-twentieth were markedly hostile to the visual, there is now a consensus that the theme of representation addresses the very essence of all scientific activity (Pauwels 2006). What is known and transmitted as science is the result of a series of representational practices. Diagrams, maps, graphs, tables, drawings, illustrations, photographs, simulations, computer visualizations, and other types of representation are used all the time in scientific research, knowledge production, and dissemination. Today we live in a visual culture with great scientific content (Burri and Dumit 2008).

This paper seeks to approach the scientific visual culture related to human taxonomy in Mexico, since the discourse on racial hierarchy has been supported by illustrations *par excellence* (Guédron 2014). According to Reid (2005, 2), "in the nineteenth century, visual representations were considered especially apt discursive tools capable of defining the meanings of race in ways that eclipsed other modes of knowledge". The authors will explore, on the one hand, the genesis of scientific conceptions of race in this country and their accompanying impact on the racialization of bodies in eighteenth century and on the taxonomy of *Homo sapiens* in the nineteenth century. Both enterprises, the racialization of bodies and the reconstruction of human ancestry produced, as one of their main epistemological results, several visual representations that circulated in both a local and a global framework. This circulation of novel representational modes strongly influenced debates on race and national identity formation (Katzew 2005), especially during the nineteenth century when the term "mestizo" powerfully appeared in the political discourse as a symbol of identity in the formation of the Mexican Nation State and as a homogenizing center of national character (López-Beltrán and Deister 2013).

3 Genesis of Scientific Conceptions of Race in Mexico

Perhaps one of the concepts that is most associated with Mexico is that of "mestizo". Mexicans know and feel that they are mestizos; it is a fundamental part of their identity. In a study pub-

2. Studies on Science and Technology (or as they are known today: Science and Technology Studies, STS) emerged during the 1960's/1970's when a number of scholars began to appreciate science and technology as socially integrated human enterprises. These meta-scientific studies are made up of interdisciplinary programs (history, philosophy, sociology, anthropology, psychology, among others). This variety of disciplines and subfields (such as gender studies and bioethics) that were crucial in the professionalization of STS took shape independently in the 1960s, and developed in isolation from each other until the 1980s, although the monograph by Ludwik Fleck (1981) *Genesis and Development of a Scientific Fact* anticipated many of the key issues of STS. In the 1970s, Elting E. Morison founded the STS program at the Massachusetts Institute of Technology (MIT), and it served as a model. At present, these studies are part of academic programs throughout the world.

lished in the *American Journal of Physical Anthropology* in 2008, Rangel-Villalobos et al. (2008) stated that 93% of Mexicans today are mestizos and that the crossbreeding had definite and precise routes, with the northern states predominantly of European origin and the south of indigenous origin, while miscegenation or *mestizaje* from African and Asian origin was low and homogeneous throughout the country. Indeed, the society of New Spain was built as a mixture of indigenous, European, African, and Asian syncretism. After Mexico's independence in 1810, it was estimated that 50% of the country's population was indigenous, 10% were Creoles, and 5% were black; the rest, 35% of the population, was considered mestizos, and they were an important part of the secessionist movement of the territory before the Spanish Crown (Katzew 2005).

However, in the nineteenth century the concept of "race" had already gained its modern currency in popular and scientific discourse. So, when did the racist views of human diversity appear? According to Bancel et al. (2014), "the epistemological moment that triggered the emergence of the contemporary concept of race occurred somewhere between 1730 and 1790 when it was invented and rationalized", but it was during the second half of the eighteenth century that racial taxonomies became formalized resulting from naturalist models that allowed for the differentiation between human groups according to somatic characteristics (11).

In Mexico, the process of racialization began early in eighteenth century as means of conferring a legitimacy of the hierarchizing of society. It is not clear yet if the study of the 'physical, intellectual and moral' bearing of the indigenous peoples of New Spain had the same spirit as the one carried out in the United States whose aim was to establish a scientific basis for the study of non-European peoples, as for example, the study of Samuel Morton from a huge cranial collection. However, "since the sixteenth century, Spaniards had transferred their own social schema to their colonies. The subordination of state to church and the ideology of *limpieza de sangre* (blood purity) where the absence of Jewish or Muslim blood defined an honorable "Old Christian", were factors in Spain's hierarchically organized society" (Katzew 2005, 39). By mid-eighteenth century, there was a perfectly differentiated caste system in New Spain and its visual apparatus was already institutionalized. What can be seen in these imaging of mestizos and other racial groups is the way in which developing visual technologies in the late eighteenth and early nineteenth centuries—technologies that facilitate contemporary theories of racial science—worked to define and illustrate for Novohispanics what race, mestizo, and specifically *the other* meant.

This caste system created by the Spaniards, based on the pre-racist theory called the *ideology of blood purity*, was confirmed by the different possible crosses that occurred in America between the three great racial trunks: indigenous, European and African origin (figure 2).

The scheme, imposed by the conquerors, was hierarchical and configured on the criteria of feudal roots from Europe, with the aim of diminishing the rights of the descendants of these people. Some of the Mexican castes were:

- Creole: Spanish born in New Spain
- Mestizo: mix of indigenous and European (figure 3)
- Castizo: mixed mestizo with European
- Mulato: blend of African and European (figure 4)
- Zambo: mixture of African and indigenous.

The ways in which this diversity of "Mexicans" was displayed had functions in different contexts, such as in the eventual process of nation-building, in myth-making projects, in the structuring and fixation of social categorization, in colonial identity formation, et cetera. "Also, caste paintings fit within European concepts of the exotic and follow the trend to classify in the eighteenth

Figure 2: Las castas mexicanas (The Mexican castes) by Ignacio María Barreda, 1777.

Figure 3: Caste painting by Miguel Cabrera (1695–1768). *From Spanish and Indian: mestizo*, now in the Museum of America, Madrid.

Figure 4: Caste painting by Miguel Cabrera (1695–1768). *From Spanish and Negro: mulato*, now in the Museum of America, Madrid.

century" (Katzew 2005). The Enlightenment represents the culmination of a process of intellectual and social transformations that laid the basis of the modern world (Malik 1996). It also "provided the backdrop for eighteenth century European theories about human difference. This century witnessed the development of the slave trade into the very foundation of the global economy, and at the same time saw racial classifications congeal into pseudo-biological kinds" (Smith 2013). Humans were now seen as part of the natural order, and naturally, the question arose: How do humans fit into that order? How should humans be classified as part of this project?

4 The European Frenzy to Classify

The work of Georges Louis Leclerc Comte de Buffon and of the Swedish botanist Carolus Linnaeus proved foundational for the search of the Natural System and for the scientific conceptions of race.

It was through the work of Linnaeus that the first steps toward developing a classification system for humans began in 1735. The first edition of his *Systema Naturae* included man and monkeys within the animal kingdom, in the category *Anthropomorpha* (Hoquet 2014). By the tenth edition he had not only created the genus *Homo*, but also subdivided it in two sub-genera. In one, *Homo nocturnes*, he placed those apes that appeared to be anthropomorphic. The second, *Homo diurnus* (or 'daylight Man'), was reserved for creatures that appeared to be more human. This second species was then subdivided into four races, to which Linnaeus assigned a series of anatomical features, moral qualities and mental aptitudes, including the following varieties: *Homo europeus*, *Homo americanus*, *Homo asiaticus*, and *Homo afer*.

Eighteenth century biologists celebrated Linnaeus for his astonishing feat in cataloging all of nature, but many were also critical of the details of his arrangement regarding humans. For example, Johann Friedrich Blumenbach considered that Linnaeus's categories were rooted in cultural prejudices as well as physical distinctions (Malik 1996).

> Blumenbach refined Linnaeus' classification of humans by rejecting all idea of human monsters. And to remove Linaneus' cultural baggage, he insisted that skull shape and size should be used as the primary means of differentiating between human groups. He eventually reordered Linnaeus' four human categories to form five varieties, naming them *Caucasians*, the peoples of the Europe, west Asia and north Africa; *Mongolians*, the peoples of East Asia; *Ethiopians* of sub-Saharan Africa; *Americans*, the native peoples of New World; and *Malays*, the peoples of Oceania. (Malik 1996)

This very language of naming races began to create the supposition that those races were real.

Anthropologists saw in these classifications a fertile ground for their investigations and soon a great variety of racial taxonomies began to appear in which the number of categories varied from three to several dozen. However, the classification of Blumembach of five races persisted, and the expression "Caucasian" was firmly established as a racial category both in the scientific and in the popular field until today (Malik 1996).

One thing worth mentioning is that according to Bancel et al. (2014) "new technological innovations during this period made it possible to refine the representation of racialized bodies, including anthropometric techniques that made systematic and scientific classification of races possible" (2). This was further reinforced in the early days of the nineteenth century by ethnic shows and imperial exhibitions that became very popular and served to disseminate a new visual culture on the races to Europeans.

5 Human Variety or Racial Difference: Ideology and Visual Presentation

The process of racialization and the circulation of the category of race occurred differently in different places. Of course, the relationship between race and the Enlightenment is far more complex than what we can account for, yet it is necessary to observe that many Enlightenment thinkers often held deeply prejudiced views of non-Europeans; it would be astonishing if they had not. As Ortega y Gasset (1914) put it "I am myself and my circumstance". Hume, for example, represents the paradox faced by the Enlightenment ideals, regarding the problem of race. In 1742, Hume wrote: "I am apt to suspect the Negroes, and in general all other species of men to be naturally inferior to the whites. There never was any civilized nation of any other complexion than white, nor even any individual eminent in action or speculation" (Smith 2013). However, Enlightenment philosophers were largely hostile to the idea of racial categorization and in their descriptions; they were making empirical descriptions more than moral condemnations. The motif that ran through the Enlightenment was an acceptance of the superiority of European civilization coupled with a belief in a common human nature and the plasticity of human varieties (Malik 1996). According to Kenan Malik, "it was the transformation of Enlightenment attitudes through the course of the nineteenth century that helped mutate the eighteenth-century discussion of human variety into the nineteenth century obsession with racial difference".

On the other hand, the nineteenth century is also extraordinarily interesting because it was the time when many nation-states fully appeared. This "emergence" was coupled with longings and displays of superiority, which were reflected in different areas of the social, cultural, economic, and political spheres. In addition, the modernization efforts often resorted to colonialism and imperialism in appealing to notions of superiority of some cultures over others and, of course, of certain individuals over others (see Jackson and Weidman 2004; Bancel et al. 2014). Thus, the concept of race was deployed largely as a consequence of the social inequality that occurs normally in colonies and empires. However, these extraordinarily persistent differences eventually became naturalized, and it was conveniently thought that the hierarchy of human groups responded not only to social actors, but also to essentialists, idealists, or typological causes (see Amundson 1998).

One of the first things that occurred at the dawn of the nineteenth century regarding the concept of race was that the Linnaean concept of species defined by four attributes came to define "racial types". Those attributes were: 1. sharing the same essence by similar individuals, 2. sharp discontinuity between species, 3. constancy through time, and 4. severe limitations in the possible variation of any species. Biologists came to think of human types, in other words, as fixed, unchanging entities, each defined by its special essence. Thus, race became a sort of fixed and immutable group, and this had profound consequences for the understanding of human variation and for its visual representation (Malik 1996).

Nineteenth and most twentieth century anthropology assumed the existence of discrete races that in the post-darwinian era were normally represented into a non-reticulating evolutionary tree. But the determination and representation of races was not the whole discussion. By the nineteenth century, the scientific debate focused on whether human biological difference was just a racial variation or represented an entirely different species. The "species" theory, polygenism, held that different races had different origins and were akin to distinct species. Thus, human "races" were of different lineages and suggested a hierarchy that positioned Africans between man and lower primates. Polygenism was the antithesis of monogenism, which espoused a single origin theory of humanity.

One fascinating example of the discussion between monogenists (such as Blumenbach, Prichard, Horn, Agassiz, Darwin, and Huxley among others) and polygenists (such as Poole, Glidden,

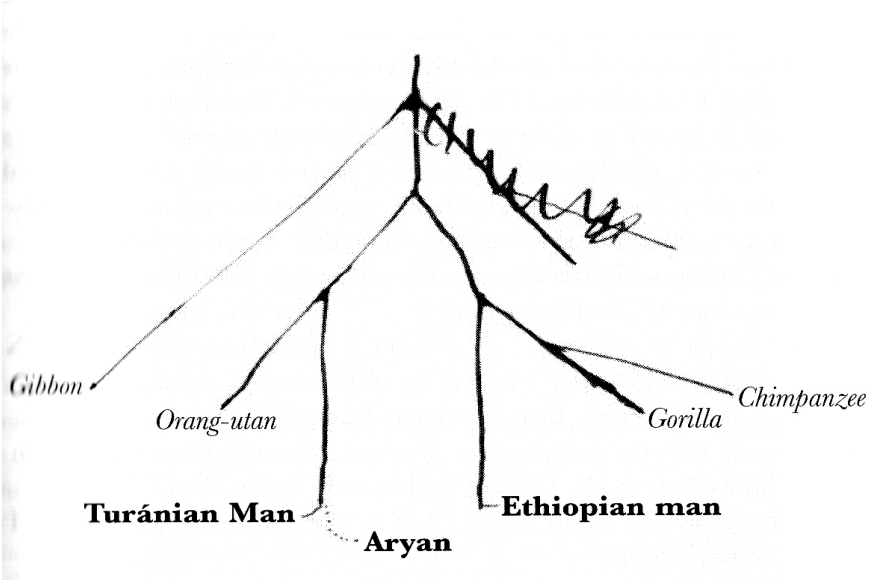

Figure 5: Diagram showing the possible origin of humans from different primate species, in Blyth's letter to Darwin, dated February 19, 1867. Darwin Archive (DAR 160:209,209)

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Puchet, Voght, and others), and also an example of the interest in the visual reconstruction of human diversity, is a descent diagram sent to Darwin in a letter dated February 19, 1867 from Edward Blyth. This diagram is Blyth's polygenist hypothesis on human origin and diversity from different families of primates, for example, Malaysians from orangutans and Blacks from gorillas. Blyth (1867) tells Darwin:

> The marked resemblance in facial expression of the Orang-utan to the human Malay of its native region, as that of the Gorilla to the Negro, is most striking, and what does this mean? Unless a divergence of the anthropoid type prior to the specialization of the human peculiarities, which however would imply a parallel series of at least two primary lines of human descent which seems hardly probable; and moreover we must bear in mind the singular facial resemblance of the *Lagothrix Humboldtii* (a *platyrrhine* form) to the negro, wherein the resemblance can hardly be other than accidental. The accompanying diagram will illustrate what I suggest (rather than *maintain*).

In response, Darwin wrote to Blyth on February 23, 1867:

> I am thinking of writing a short essay on Man and have consequently been much struck with your remarks on the Orang. Do you know C. Vogt's nearly similar remarks on the origin of Man from distinct Ape-families, founded on Gratiolet's observations on the brain? I think you cannot object to my cautiously alluding to your observation on the similarity of the Orang and Malay andc: I think the similarity must be accidental." (figure 5, Darwin 1867)

After the publication of Darwin's controversial theory, the discussion about the ancestry of humans became a hot topic, although it was not part of the *Origin*. The only reference to human evolution is a very short sentence: "light will be thrown on the origin of man and his history" (Darwin 1859, 488). However, it was easy to extrapolate Darwin's ideas to the nature of man, and the debate about human origins and their relationship with other living things soon emerged.

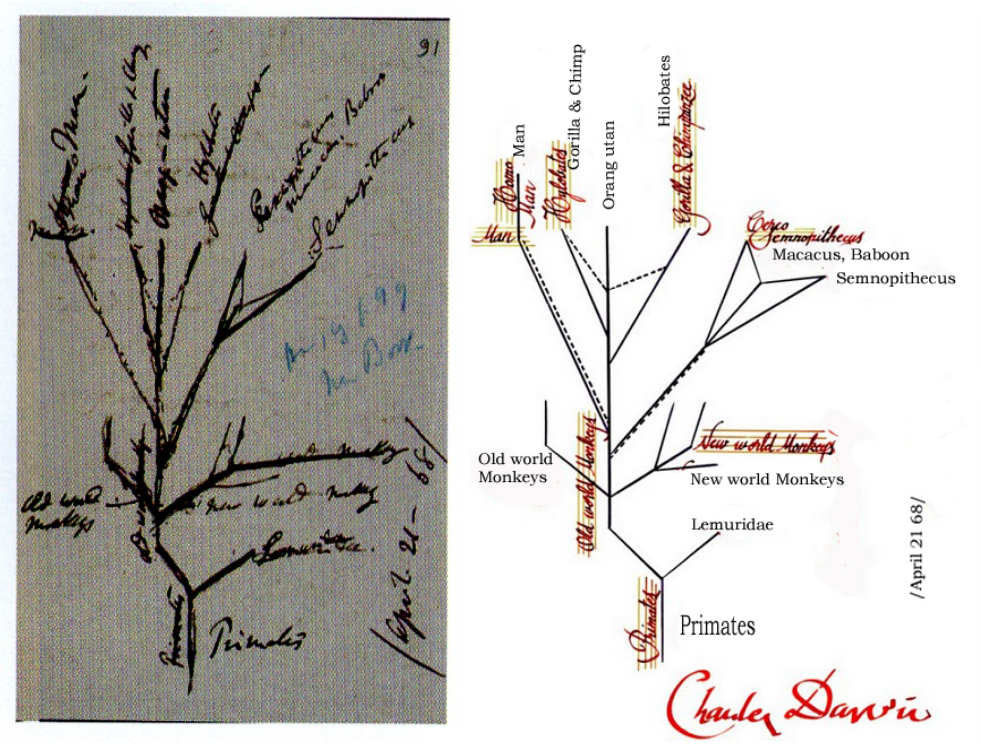

Figure 6: Darwin's sketch of primate genealogy, 1868. This diagram was never published by Darwin.

Adding to this, in the 1860's British audiences became deeply interested in gorillas as a result of the activities of explorer Paul du Chaillu. In 1861 he toured England with his collection of simian heads and published the book *Exploration and Adventure in Equatorial Africa*, in which he described and depicted various encounters with these primates. Thereafter, much was discussed about apes. It was thought that if there were a close, simian relative of humans, it had to be the gorilla. Moreover, it was common to regard Africans as intermediates in likeness between gorillas and European Caucasians, since it was unclear whether human races were a single or more species (Voss 2010). What was increasingly clear was that human hierarchies were given by natural laws.[3]

In 1868, Darwin drew a sketch to illustrate his ideas on the matter (figure 6). His conclusion was that gorillas and chimpanzees were the closest relatives of humans and that the different races were part of one single species: *Homo sapiens*, which only represents one more branch of the genealogy of primates, without a prominent or exceptional place. It was precisely Darwin's ideas that marked the beginning of the end of the debate between monogenists and polygenists. After the publication of the *Origin*, the idea that genealogy could account for the similarities and differences between organisms began structuring biological thought. Perception of natural affinities changed from a 'creation plan', characterized by similarities and differences among species, to that of 'kinship', characterized by genealogical relationships. Regarding human origins, the challenge became to represent a single story (Torrens and Barahona 2016).

Naturalist Ernst Haeckel—who in 1861 was twenty-seven years old, had a doctorate in zoology and was newly appointed as a professor of comparative anatomy at the University of Jena—immediately accepted Darwin's two main ideas: that natural selection was the cause of

3. Thinking of human hierarchies in terms of natural laws was a very plausible account in nineteenth-century philosophy of science and hence of nineteenth-century racialism. Amundson (1998) argues that the main nineteenth-century debate was between teleologists and morphologists. The position of scholars advocating for natural laws underlying human hierarchization falls into the morphologist position.

descent with modification through generations and that the natural system had to be genealogical in its arrangement. Darwin had shown this with his branched diagram first and then with his written metaphor of the 'Tree of Life' described at the end of *Origin's* Chapter 4 (Dayrat 2003).

Haeckel read *The Origin of Species* in 1860 and again in 1861 (Richards 2008, 68). He was so impressed that he wrote to Darwin in 1864:

> Of all the books I have ever read, not a single one has come even close to making such an overpowering and lasting impression on me, as your theory of the evolution of species. In your book I found all at once the harmonious solution of all the fundamental problems that I had continually tried to solve ever since I had come to know nature as she really is. Since then your theory I can say so without exaggerating, has occupied my mind every day most pressingly, and whatever I investigate in the life of humans, animals or plants, your theory of descent always offers me a harmonious solution to all problems, however knotty. (Haeckel 1864)

Indeed, Haeckel became one of the most influential propagandists for evolution.

Haeckel believed that the embryonic development of an organism—its ontogeny—revealed its evolutionary history—its phylogeny. He called this the 'biogenetic law' (Richards 1992). This implied that if an individual repeated in its development the main stages of evolutionary change which his ancestors passed through during their long paleontological development (ontogeny recapitulating phylogeny), then genealogical reconstructions could be reconstructed from observations of development.[4] It was Haeckel who coined the word 'phylogeny'. In 1866, using his biogenetical law and driven by the development of Darwinism, Haeckel published his *Generelle Morphologie des Organismen* (General Morphology of Organisms), which is a treaty on the evolution of the organic world, humans included. In this book, Haeckel established that "the natural system for organisms for us is their natural *Stammbaum* (stem-tree), their table of genealogical relationships" (Haeckel 1866, I:196). He included eight genealogical trees or the so called *Stammbaum*. These diagrams reflected his hypothesis on the origin of life and on the genealogical relationships among groups of organisms.

In his main three books, *General Morphology of Organisms* (1866), *The Natural History of Creation* (1868), and *The Evolution of Man* (1874), Haeckel reconstructed the history of life in many bushy trees (figure 7).

In *General Morphology of Organisms* (1866, 300), Haeckel established two ways to represent two distinct concepts. When he represented the natural system for the whole of life or for a particular phylum,[5] he employed a branching stem-tree. But when he explored the individual developmental history of a certain organism, the resulting representation was an unbranched or linear chain of forms. His most famous representation of the developmental history of man was

4. However, Haeckel was thinking in terms of the 'development metaphor'—the analogy of evolutionary change with the growth and development of the individual—and never managed to build a complete genealogy or line of descent as the one Darwin had in mind. The biogenetic law does not actually reveal a series of hypothetical ancestors, but their main morphological stages temporally rooted in a paleontological dimension (Pappavero and Llorente 1996). In addition, Darwin—who avoided conjecture and guesswork at all costs—drew an abstract diagram of the pattern of evolution, not daring (publicly at least) to build genealogies for actual groups. In Darwin's figure, the passage of time is represented merely as generations. Haeckel instead decided to illustrate most of his genealogies as real trees or shrubs with labyrinthine branches connected to thick trunks with bark. He went as far as using his own creativity where there was no scientific evidence, including modern forms called 'living fossils' to represent older stages of some branches—knowing that each *phylum* continues to change after its arising—and tracing the origin of groups in geological time (Dayrat 2003).

5. The word *phylum* was coined by Haeckel to refer to all species descended from a common parental form.

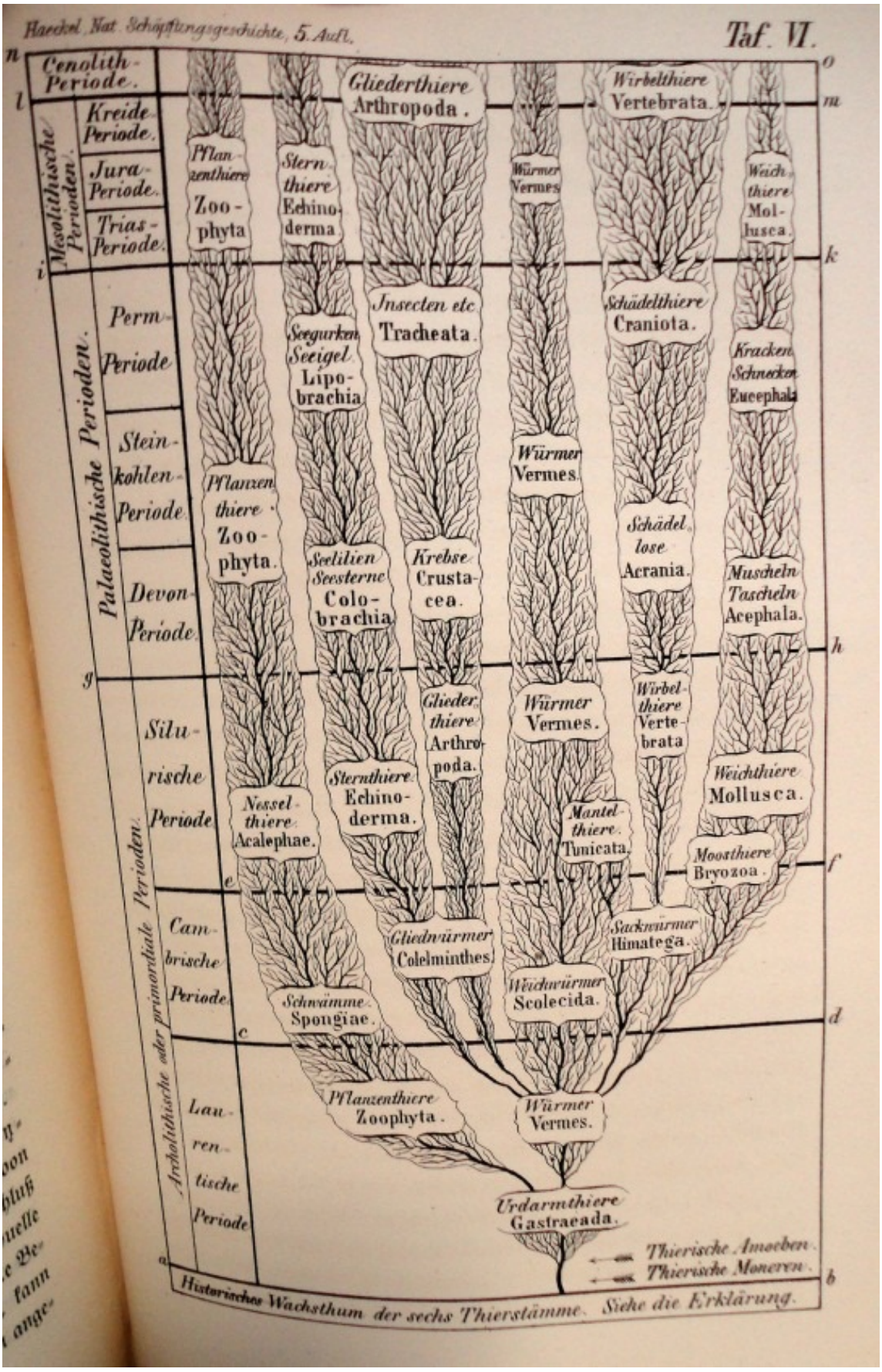

Figure 7: Chart VI Genealogy of animals in Haeckel's *Natürliche Schöpfungsgeschichte*, 1874.

The Pedigree of Man published in 1874 (figure 8). Taken out of context, this image eventually became an archetypal motif for popular representations of evolution.

Certainly, one interesting aspect of this image is the repercussion it had on the subsequent representation—and misconstruction—of evolution, particularly in the public realm. Many scientists took Haeckel's *Stammbaum des Menschen* as to represent a complete phylogeny of life—that is, a complete system of evolutionary descent among organisms—forgetting its justificatory conception. They forgot that it intended to trace the individual developmental and paleontological history of man, in a linear arrangement of man's progenitors—man's direct chain of ancestors, as described in page 257 of Haeckel's book.

In this image Haeckel was experimenting with man's origin. His attempt was to show the portion of the phylogeny corresponding to man, in an unbranched, lineal chain of forms, as he would have done with any other individual species. By appreciating this image as a whole phylogeny, some fundamental notions, misinterpretations, and prejudices may be noticed.[6] The first was the assumption of Haeckel's linear, hierarchical, and progressive view of the evolutionary process culminating—very similar to the chain of being—in humankind. The second was that Haeckel assumed that each side branch had retained the same level of complexity since it emerged. The third was Haeckel's conjecture that early apparition in time meant primitive but also numerically restricted (Catley and Novick 2008; Hellström 2012).

Yet, in the popular realm, reading Haeckel's tree as representing a complete phylogeny of life gave rise to multiple non-Darwinian images—eventually named 'Trees of Life'—that helped to spread a hierarchical and progressive view of evolution. These images soon became iconic; and following our idea of showing that the visual representation of human taxonomy has been subject to both biological and historical discordances, the reader will find some late nineteenth and early twentieth century reinterpretations of Haeckel's *Stammbaum des Menschen* in works aimed to popular audiences (figures 9 and 10; Torrens and Barahona 2012).

In all these trees, there is a main trunk leading to humans. In Shute's case, the trunk represents a linear chain of ancestors—primitive geologic forms in his own words—and terminal branches representing modern forms. Although the conclusions underlying Haeckel's tree differ from those underlying the trees from the previous examples—the first for considering evolution as an analogy of development "insisting that "ontogeny is a short and rapid recapitulation of phylogeny"—to the extent of bending his visual evidence to demonstrate identical stages in the embryological development of different species" (Kemp 1998), and the latter for orthogenetic ideas very popular among American scholars[7]—the result of the illustrations is the same: a hierarchical, orderly and progressive interpretation of evolution.

Moreover, the representation of humans shows the prejudices and clichés of the period's cultural evolutionary narrative (Clark 2008). Apart from depicting man in a central, upper position, the figure at the top of the trees depict in Whyte's tree (figure 9) a 'caveman' and in many other publications a Caucasian.

Since the late nineteenth century, the image of the caveman began to become popular, not only as an icon of a 'primitive' stage of human evolution or of human development itself but as a symbol of roughness, crudeness and vulgarity, as well as of a primitive masculinity. Amidst the evolutionary debates of the 1920s, the image of the caveman reached far and wide (Moser

6. Many scholars have directed their efforts toward analyzing this image and have shown that some assumptions and conflicts of nineteenth century biology are evident within its branches (Bowler 1990; Dayrat 2003; Clark 2008). For example, the belief in the superiority of mammals over the rest of the Animal Kingdom which is evident in that a quarter of the tree is dedicated to this class, while lower branches that seem to stop evolving represent the most 'primitive' groups, protozoa, in what would seem an upward journey of life.

7. Orthogenetic ideas implied various kinds of forces inherent to organisms which drove them through linear and progressive evolutionary trajectories as those seen in the fossil record.

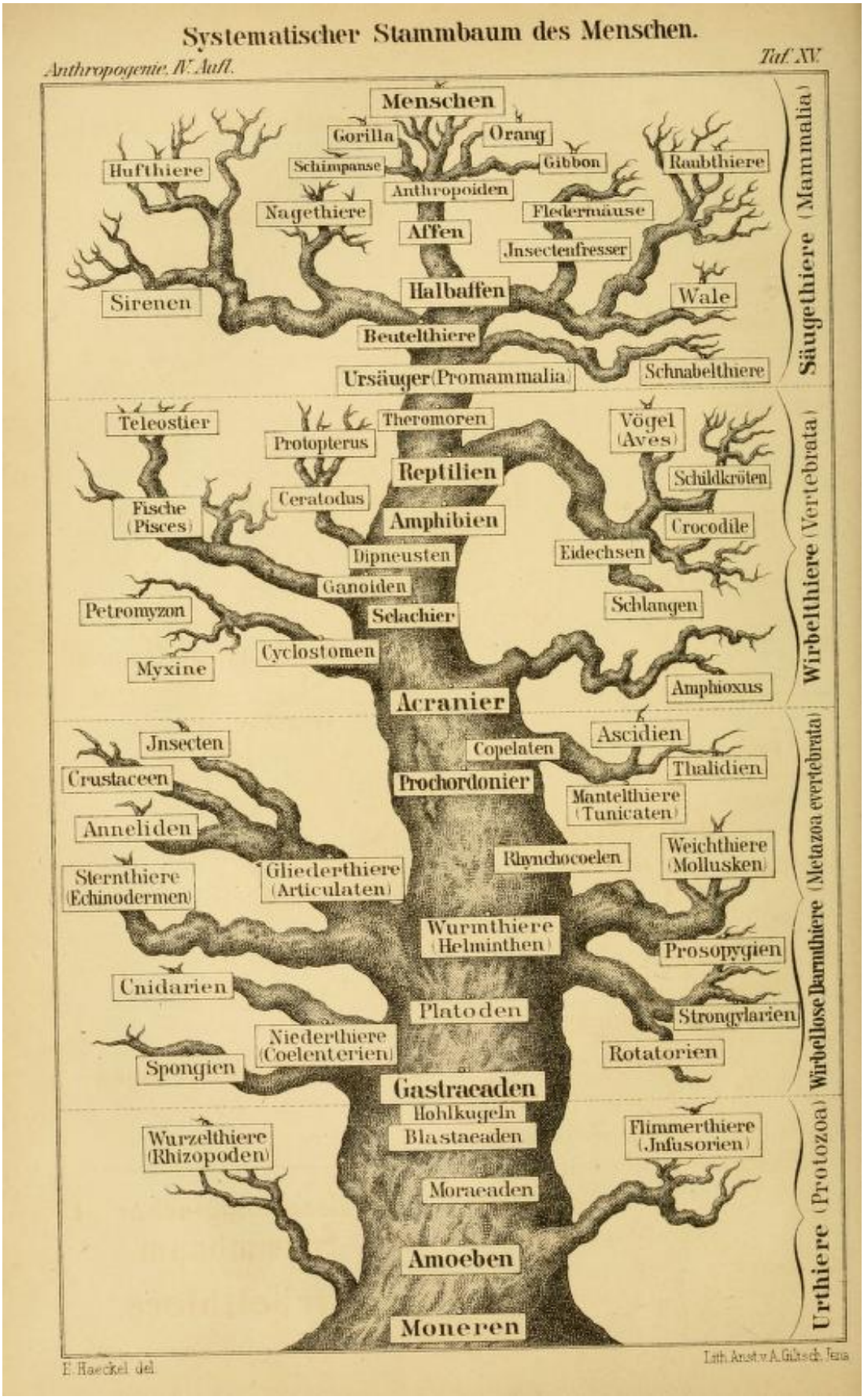

Figure 8: Table XII *Systematischer Stammbaum des Menschen* (Genealogy or pedigree of Man), in Haeckel's *Anthropogenie*, 1874.

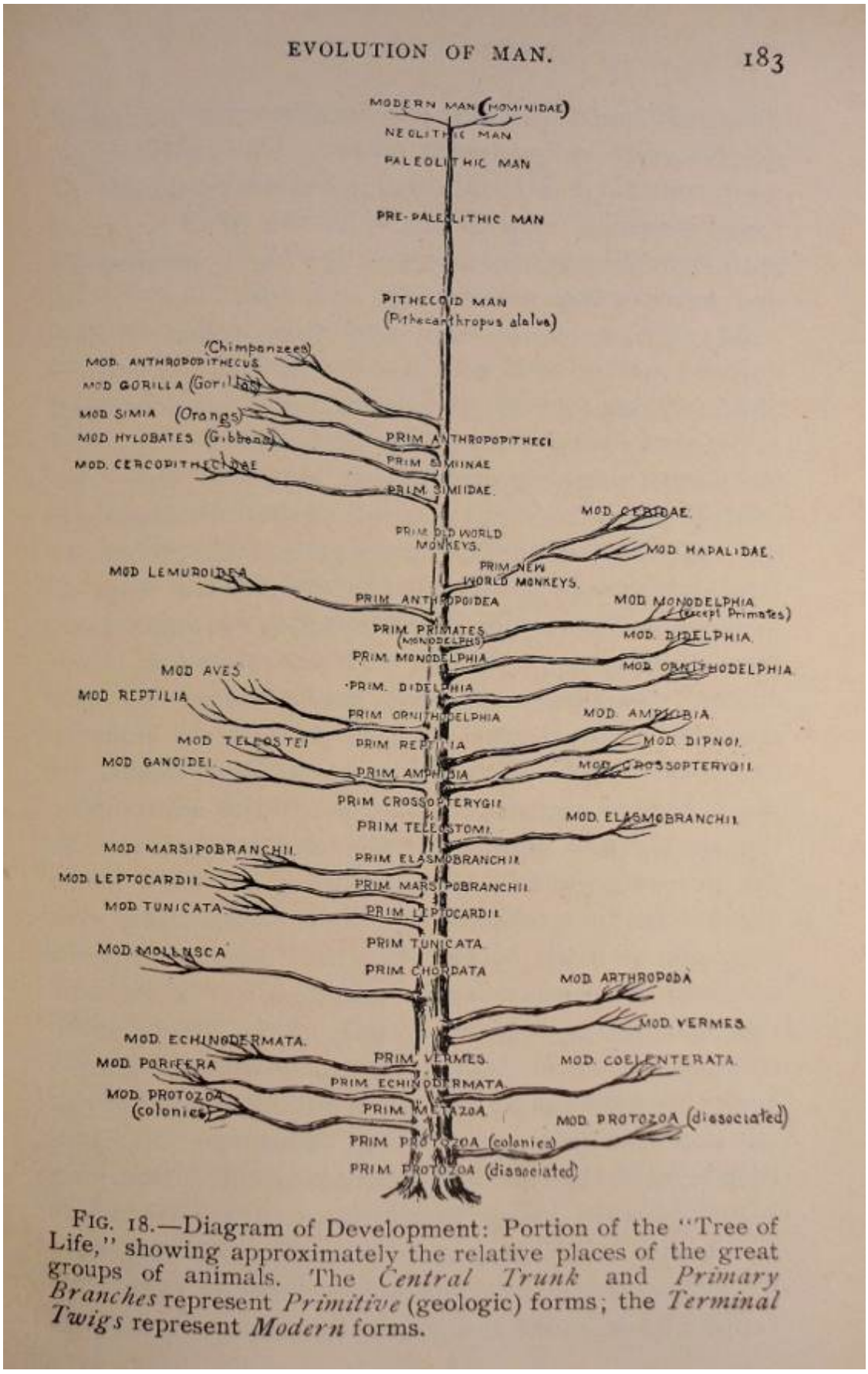

FIG. 18.—Diagram of Development: Portion of the "Tree of Life," showing approximately the relative places of the great groups of animals. The *Central Trunk* and *Primary Branches* represent *Primitive* (geologic) forms; the *Terminal Twigs* represent *Modern* forms.

Figure 9: Kerfoot Shute's 'Evolution of Man', in *A First Book in Organic Evolution,* 1890.

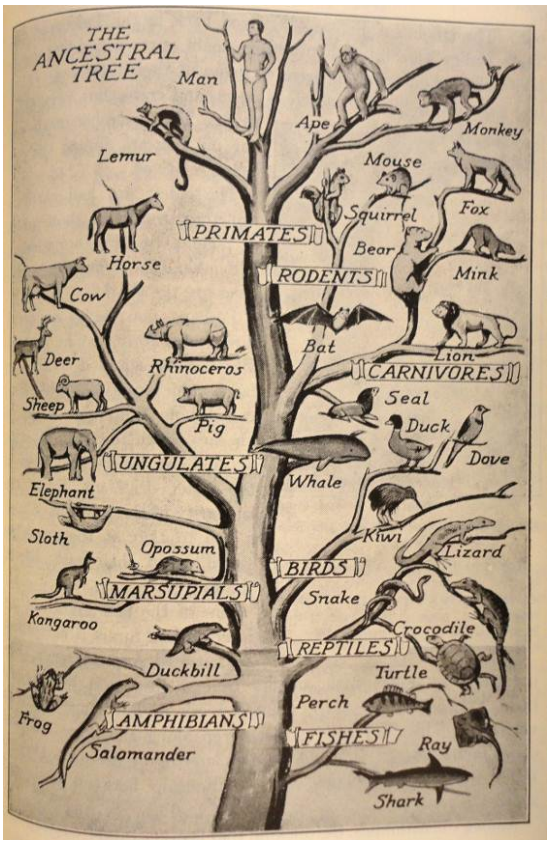

Figure 10: Gowans Whyte's 'Tree of Life', as frontispiece of his book *The Wonder World We Live In*, 1921.

1998; Berman 1999; Clark 2008). He could be found in novels, works of art, cartoons, theater plays and films; reflecting the concepts of race, gender, evolution and civilization concerns characteristic of that time. So 'the caveman' served as an element, along with apes, missing links and images of past environments, for shaping the image of evolution in the minds of the audience. Whyte's use of the caveman image is not unique, for it was common to represent human beings at the tip of the tree of life with this imagery (Clark 2008).

The Caucasian man in Smallwood's tree, which was already a convention in artwork, also reflects a widespread cultural, nationalistic, colonial and political idea of that time: the white man's superiority over other races.

6 Human Evolutionary Trees: Common Descent … or Ascent?

The publication of *On the Origin of Species* and *The Descent of Man* aroused a great interest in paleontologists. They turned to finding evidence of the ancestry of man. When fossils of early hominids started to be found, trees that reflected both the findings and the beliefs of the era soon emerged.

Besides Haeckel's attempts to trace man's origin, another early effort was Eugene Dubois's genealogical tree published in *Nature* in 1895. Dubois was Haeckel's disciple and Haeckel supported and spread the notion of the 'missing link' even suggesting the location it might be found (Richards 2008). In 1890 Dubois found the remains of a specimen in Java called Pithecanthropus or 'Java Man', now known as *Homo erectus*. He referred to it as the 'missing link of Darwin' and placed it in the middle of the branch leading to humans (figure 11).

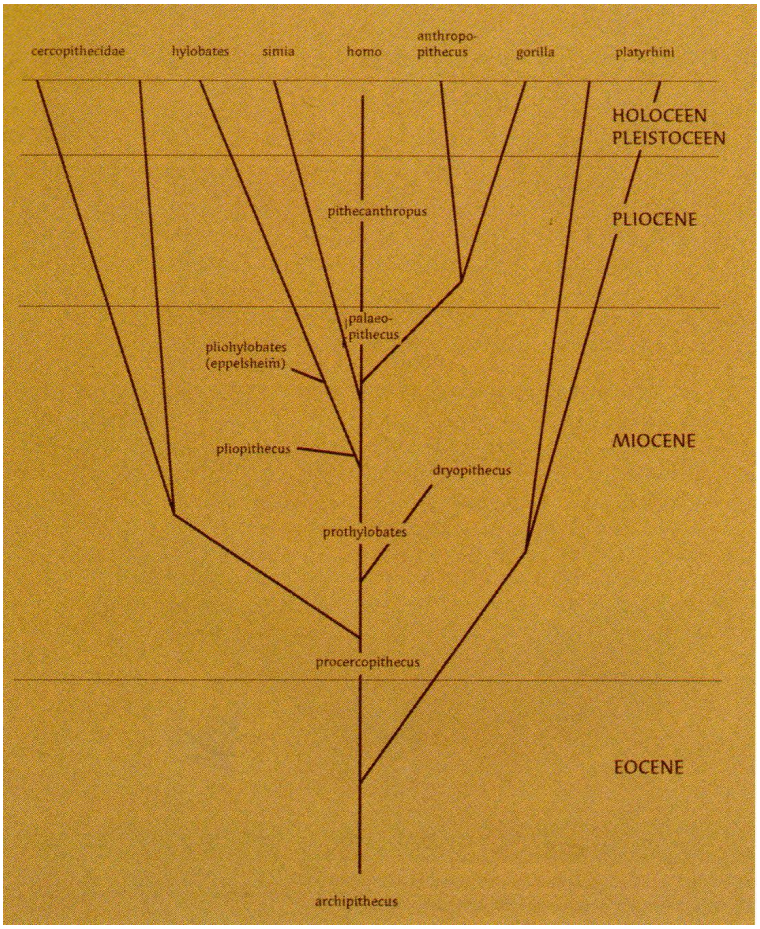

Figure 11: Eugene Dubois's 'The place of Pithecantropus in the Genealogical Tree', published in *Nature* in 1895. It shows Pithecanthropus as the 'missing link' between man and simian.

In the first decades of the twentieth century, with more fossils to place in the human family tree, many phylogenies were proposed. Interestingly enough, scientific trees differed greatly from those for non-specialists, sometimes even in the hand of the same author. The 'scientific' diagrams were trees in the most abstract sense, employed to represent hypothesis about the branching pattern of primate evolution. The 'popular' visual images were in general literal trees that despite their abundant branches had a main trunk to represent a linear ascent of man. Some diagrams depicted the different *Homo sapiens* races in an ascending scale: from Africans—at the bottom or on the left side—to Europeans—at the top or on the right side. This design, repeated in certain textbooks, popular books, and museums, was the dominant visual lexicon used to popularize evolution over several decades. Except perhaps for images of racial hierarchy, it was the way in which human evolution was apprehended by the audience. It became the familiar popular version.

An example is the 'Family Tree of Man' by British anatomist and anthropologist Arthur Keith, published in his book *The Antiquity of Man* in 1915 and later in 1925 (figure 12). Arthur Keith was a major figure in the study of human fossils and leader in the field of human evolution.

His 'tree' has many interesting attributes. It is dedicated to apes and humans. The branches leading to monkeys are cut off after their radiation from the common stem. The diagram made explicit the dimension of time. Past epochs are indicated by layers of stone—depicted by a symbolic system of lines—measuring the distance from the present in thousands of years. This gives an idea of when the main radiations of apes and hominoids took place. Species of apes are represented at the top, just like the different human races, reinforcing the message of racial hierarchy—beginning to the left with the 'inferior' Africans and ending to the right with the 'superior' Europeans. The deep bifurcation of the trunk separating the simian stems from the human one powerfully adds greater distance between them.

Another interesting aspect observed in Keith's tree is that he was one of the proponents of the 'Piltdown Man'. In 1912 Charles Dawson found in Piltdown England fragments that were identified by a group of experts, including Keith, as representative of the 'first' humans. They were parts of a skull like a modern human cranium, plus a simian jaw. Under the misconception that human ancestors had to be similar to modern primates, it was announced as a 'missing link' between humans and apes. This launched a debate that lasted 40 years. In 1953, it was determined that the so-called *Eoanthropus dawsoni* was a fraud; a deliberate combination of modern human and orangutan parts. However, until the early 1950's the 'Piltown Man' was included in human phylogenies and in several representations of the human ancestry, just as in Keith's tree.

7 Human Taxonomy in Mexican Visual Culture

As mentioned before, in the late nineteenth century, reinterpretations of Haeckel's *Stammbaum des Menschen* began to appear in works aimed to popular audiences. Curiously enough, a Mexican was possibly the first to develop an affinity tree like Haeckel's. This is a large painting composition embodied in the national map-room of Mexico, authored by the Oaxacan Manuel Antonio Ortega Reyes (1819–1908) and entitled "Synoptic Table of Natural History" (figure 13).

In 1877 Manuel Ortega dedicated this painting to Porfirio Diaz, then president of Mexico. It is exhibited in the National Map of the City of Mexico. This work was proposed as an epistemic instrument in the new scientific project of the Mexican nation. It clearly reflects the circulation of knowledge of popular scientific topics of the time, such as the geological characteristics of the Earth, the classification of the kingdoms of nature, and the placement of man at the top

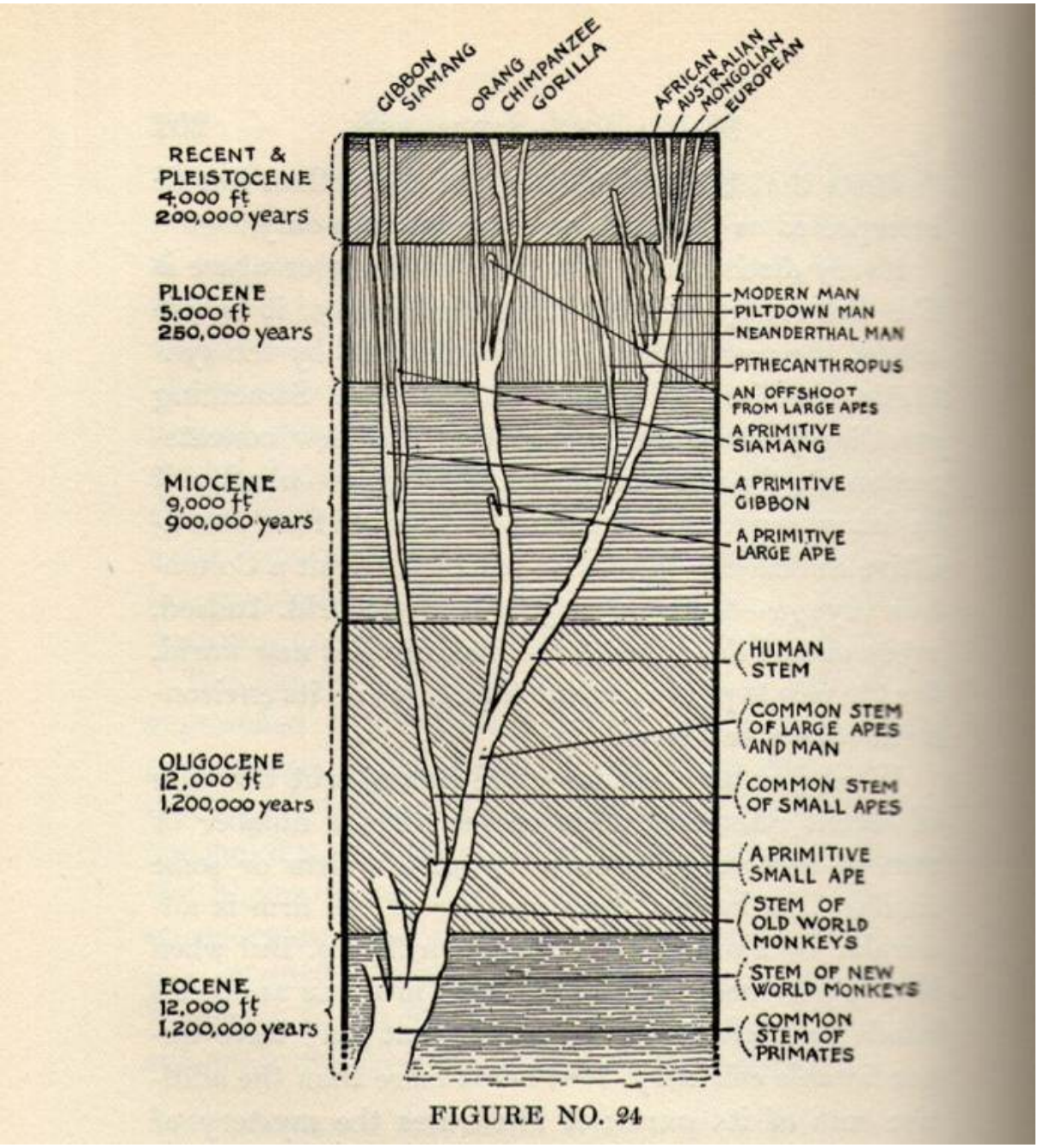

Figure 12: 'Family Tree of Man' in Arthur Keith's *The Antiquity of Man*, 1915.

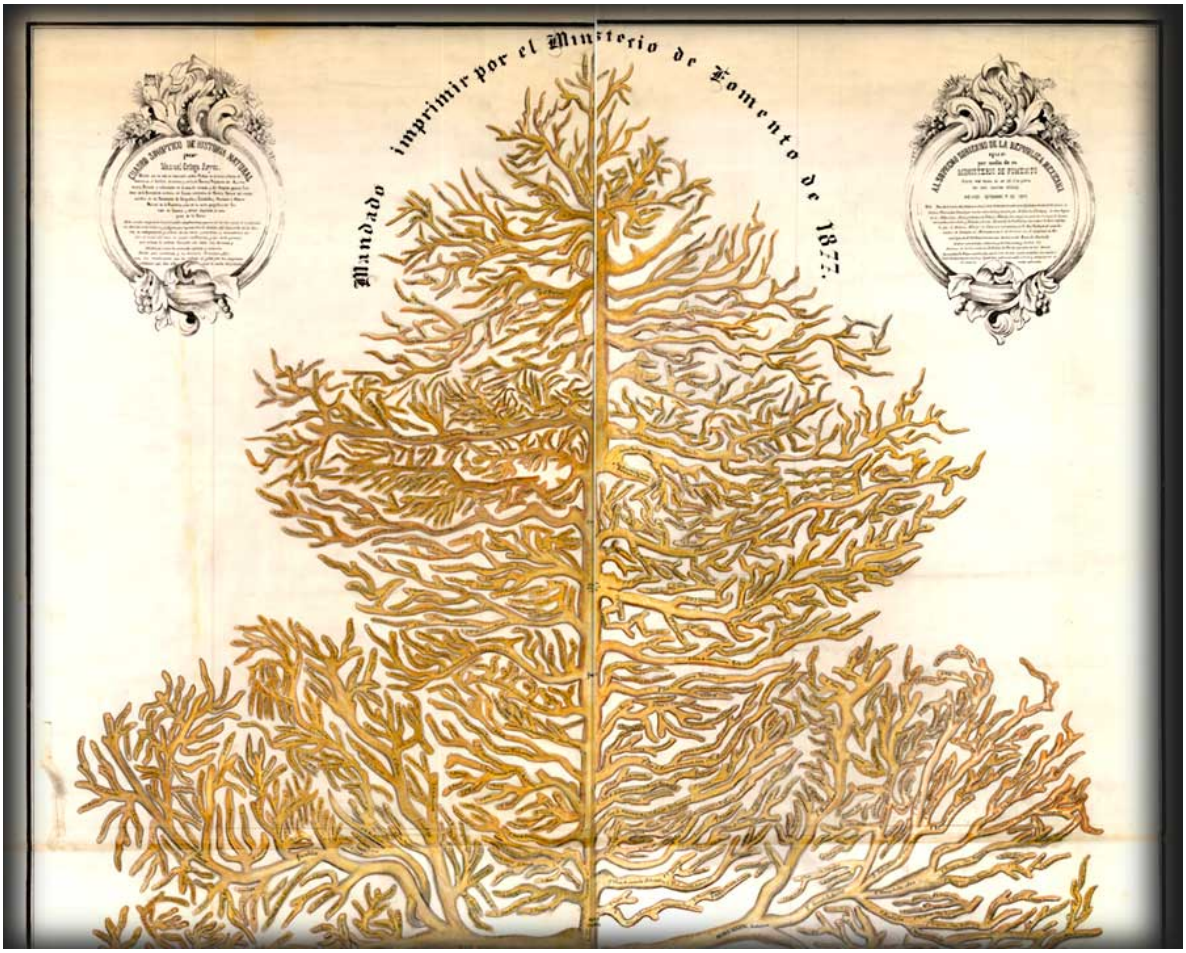

Figure 13: Top portion of Manuel Ortega's "Synoptic Table of Natural History", 1877.

of the rest of organisms. This impressive painting clearly resembles Ernst Haeckel's *Pedigree of Man*.

Referring to the tree portion of the drawing, which is called Tree of the Classification of the Kingdoms of Nature, it is obvious that this is a great compendium of the classifications and species that composed the three kingdoms of geology, botany and zoology, presented as an ambitious all-integrated single tree. Even though it is a lush tree compared to Haeckel's, it has the same elements: a main trunk leading to humans representing a linear chain of ancestors—primitive geologic forms in Ortega's words—and terminal branches representing modern forms.

As we ascend the central trunk that leads to the animal kingdom and reach the top, we can see that Ortega, unlike Haeckel, places humans according to the classification of a polygenist, most probably the French naturalist Julien-Joseph Virey. Virey was an advocate, with the majority, of the notion that the Caucasian caste of the white race must be placed in the pinnacle of a natural classification (Lerín Contreras 2014). Interestingly, Ortega does not place any Mexican castes in any of the seven main terminal branches.

In the upper part of the painting, Ortega explicitly quotes several works of Natural History that served as inspiration, including those of Humboldt, of Antoine Paulin Germain Salacroux, and of Eduardo Chao. Referring only to the upper portion of the tree that belongs to human beings, Ortega classified humans hierarchically in races and castes, according to his perceived degree of intelligence. The four main races correspond to the white race (whose castes are: Arab, Celtic, and Teuton), the yellow race (whose castes are: Chinese, Mongolian and Laponian), the Copper or American race (whose castes are: North and South), the dark black race (whose castes are: Black-Malay, Mañaya, Malaya-Árabe), the Ethiopian black race (whose castes are: blacks and Kaffirs) and the blackish race (whose castes are: Hottentots and Papuans). It is interesting to point out that some colonial Mexican castes have their own branches.

This image is provocative for several reasons. On the one hand, with this classification tree it is possible to appreciate that in Mexico the notion of race became a way to explain the history of society. On the other hand, this tree is a product of a transnational interchange of ideas and collaborations. In this regard, it is interesting to note that the State of Oaxaca in the mid-nineteenth century was a state with a strong liberal ideology, positivist and egalitarian, in which there were diverse institutions dedicated to the sciences and the arts, as well as scientific societies. Ortega, a contemporary of important personalities such as Benito Juarez and Porfirio Díaz, was a representative and promoter of scientific and educational advancement in the state.

The scientific circles of the Porfiriato, to which Ortega Reyes belonged, were connected to the international scientific production. Additionally, the Mexican Society of Natural History, of which he was a member, published the *Scientific Journal* and *La Naturaleza*. At that time, Mexican science was felt to be a part of—and indeed belonged to—a world-class international community.

8 Conclusions

Although the study of the visual representation in science is very recent, many studies have shown that the growing interest in visual images in science has allowed us to understand their role in the construction, circulation, and validation of knowledge production. In this way, studying the visual imagery of human taxonomy in eighteenth and nineteenth centuries in Mexico, especially the discordant conceptions of species and race, allowed us to highlight the racialization of bodies and the reconstruction of human ancestry that circulated both in local and global contexts.

Biology and anthropology have had a close relationship since the nineteenth century when many projects arose trying to identify and classify human and cultural diversity. With the advent of evolutionary thinking in the second half of the nineteenth century, human taxonomy produced a vast number of genealogical trees that led to important discordance in the racial classification of *Homo sapiens*. Such trees show, on the one hand, the use of race as a classificatory tool to identify human differences with a strong Eurocentric input, and on the other, the importance of the visual representation in the popularization, not only of evolutionary ideas, but also of human origins. The latter makes an interesting example of how concepts, such as race, are provided as scientific truths that set the tone for rationalizing the situations found in imperial/colonial states.

We have shown that the genesis of the scientific conception of race in Mexico dates to the eighteenth century, when naturalist models were produced to differentiate between human populations according to somatic characteristics. This was done as a means of conferring legitimacy on the hierarchizing of Mexican society. The caste system in New Spain and its visual representation were institutionalized by the mid-eighteenth century in a way that it defined and illustrated the Novohispanic conceptions of race, mestizo, and other racial categories.

With the popularization of evolution in late nineteenth century, and the acceptance of the idea that genealogy could account for similarities and differences between organisms, perception of natural affinities in man changed from a creation account to genealogical relationships. In this way, many naturalists began to represent the history of life and human origins. Haeckel, for example, re-constructed the history of life in a bushy tree, becoming an archetypal motif for popular representations of evolution. By the end of the nineteenth century and the beginning of the twentieth century, naturalists such as Shute, Whyte, Dubois, and Keith produced a myriad of branching trees to identify human diversity charged with racist ideas and evolutionary misconceptions.

In this context, Mexican naturalists were not the exception, as evidenced by Ortega's genealogical tree. Ortega's tree represents Mexican interest in the problem of solving the Natural System, in the classification of living beings in general and in the creation of a racial taxonomy of humankind (the discussion of the place of man in nature and the diversity of races). In this sense, it is remarkable that in 1884, Alfredo Dugés's article entitled "Considerations on the Natural Classification of Man and Monkeys" was published in the magazine *La Naturaleza*. It presents a synoptic table with the accounts and perspectives of various naturalists on the location of man among animals. The latter shows that Mexico was not at the margin of the discussions going on between biology and anthropology in the nineteenth century, and that materialistic explanations were sought for the origin of life and the relations between species and between differences in humans. This shift to evolutionary classifications, however, contrasts sharply with the use of the term "species" born out of the eighteenth century's pre-evolutionary thinking. The use of "race" as a concept to identify human biotypes in an essentialist way is loaded with colonialist judgments. In this sense, locating Ortega's mural in a public building was a way of giving public and institutional recognition and support to inequality—a way of making inequality a natural thing. This attitude and way of thinking regarding racism and stereotyping has permeated to the present day, something of which we have shown only an example.

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