Part I - Parasites, Human Hosts, and the Environment

3. The History of Paleopathology in Brazil: skulls, parasites, and diseases from the past

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The History of Paleopathology in Brazil: skulls, parasites, and diseases from the past

Sheila Mendonça de Souza

Paleopathology in Brazil is part of a scenario that has witnessed enormous transformations, as in many other countries. The roots of Brazilian paleopathology lie partly in classificatory studies of human skulls, but the field has also grown to formulate explanatory models for the peopling of the continents and human living conditions, based on signs of diseases from the past. The field relates to the study of normal morphological variability, but has been modulated by anthropology and archaeology and linked to medicine at various times.

Paleopathology is a hybrid, interdisciplinary, multidisciplinary, and transdisciplinary field, sharing medical and archaeological studies. Amidst skulls, parasites, and signs of ancient diseases, paleopathology still shows signs of separation between the disciplines (i.e., non-integrated use of areas of knowledge). In Brazil, the consequences of such a non-linear history involve not only the nature of the field itself, but also the string of facts and social and academic conditions that framed the initial research, discoveries, and (of course) professional training. In recent decades, North American paleopathology has become the center of bioarchaeology, and Brazil has followed these same steps.

Bioarchaeology is a relatively new concept. The name is currently used for the field of studies on the archaeological remains of human bodies. Contrary to previous practice, the term is no longer applied generically to the study of all biological remains in an archaeological site. Bioarchaeology seeks to tell the history of diseases by relating them to lifestyles, human behaviors, and the origins of groups from the past (Larsen, 1997).

One of the innovative characteristics of bioarchaeology is that by extrapolating the physical confines of laboratories, its work begins in the field, in archaeological excavations. Until the mid-20th century, the study of human archaeological remains focused mainly on the racial question and attempts at typological and evolutionary classification. Since the 1970s, greater attention has focused on the development of approaches using health as a biocultural indicator, becoming one of the driving forces in studies of human remains. The concept of bioarchaeology is now based primarily on the possibilities offered by paleopathology.

However, the history of bioarchaeology (and obviously that of paleopathology) in Brazil cannot be dissociated from the international scenario. It is thus interesting to observe the relative independence between the scientific fields of anthropology and paleopathology.

As a spinoff of what was then the recently founded field of pathological anatomy, paleopathology predated anthropology and was closely related to the emergence of modern scientific medicine. Eighteenth-century morphologists, anxious for new possibilities to demonstrate the power of their tools, explored the normal and the pathological (Canguilhem, 1990), identifying lesions and anomalies. The human goal of diagnosing diseases is quite recent, but the concepts of pathology and disease are mutable, as are the fields that study them (Carvalho, 1996). Paleopathology emerged from scientific pathology, but it also changed over time.

Johann Friedrich Esper published one of the first studies in 1774, describing a pelvic fracture in a fossil mammal from the Pleistocene. At the time, paleopathology was still virtually limited to the study of extinct animals. The 19th-century fathers of medical pathology, including Rudolf Virchow, began to explore the diagnostic possibilities of archaeological findings, proving that their new science was so powerful that it could even diagnose diseases and lesions in ancient beings. Before anthropology could surpass taxonomic or evolutionary views, physicians were already applying techniques like radiology and histology to study mummies and bones preserved by fossilization or embalming.

Paleopathology in Brazil began in the 19th century, as in many other countries, but unlike elsewhere it developed slowly and was always closely linked to the medical field (Souza & Guichon, in press). The scarcity of researchers and professors dedicated to the theme certainly contributed to the delay in scientific output, so that the field's history in Brazil was long and gradual. However, recent decades have witnessed a multiplication of researchers and institutions dedicated to paleopathology and bioarchaeology, as well as the growing internationalization of research output. Along with Brazil's pioneering role in such fields as paleoparasitology and the fast growth of our academic faculty, these developments have given Brazil a leading position in the Americas, making paleopathology a thriving discipline in the country.

For a century, Brazilian research on the archaeological remains of human bodies was performed basically within physical anthropology, but in the last five decades the studies on history and prehistory have been greatly enriched by knowledge associating health, lifestyles, and the environment. Although experiencing late development as a field of research, paleopathology in Brazil skipped the long pathographic stage, which mainly constituted the second period in the history of paleopathology (Jarcho, 1966; Buikstra & Cook, 1980).

When Brazilian paleopathology reemerged vigorously in the 1970s, it was influenced by the third period in the field's scientific output, focusing on more population-based and anthropological approaches, despite maintaining roots in medicine. Influenced by the paths identified since the 1960s by Lawrence Angel (Buikstra, 1990), paleopathology in Brazil is heavily oriented towards paleoepidemiology.

In Brazil, classical themes in paleopathology such as syphilis, tuberculosis, and cranial trepanations received little attention, probably due to the characteristics of Brazilian collections. The training of researchers under the paleoepidemiology school (represented by Della Cook) and the close proximity to the public health field contributed to increasingly population-based approaches to the health of ancient human groups.

This chapter provides a brief history of when and how paleopathology has been practiced in Brazil, and by whom. The chapter also honors the memory of several nearly forgotten researchers, highlighting their contributions to the field.

IN THE BEGINNING WAS PHYSICAL ANTHROPOLOGY

Physical anthropology in Brazil began as a science in Rio de Janeiro in the mid-19th century (Faria, 2000). The motivation appears to have been the finding of the first human remains contemporary with the extinct Pleistocene fauna, in Minas Gerais State. The mineralized bones were among the first to be found in the world, after Neanderthal in Lazareto, France, in 1826. The finding of such ancient humans at a time when creationist ideas still prevailed had a huge impact on the scientific community.

According to Alfredo Mendonça de Souza (Souza, 1991), despite publication of descriptions of skulls from Lagoa Santa, Minas Gerais, systematic anthropological studies only began in the late 19th century, aimed at explaining differences between humans from the so-called Lagoa Santa “race” and the *sambaqui* (shell mound) builders (Lacerda, 1885).

These early human archaeological remains in Brazil were discovered by naturalist Peter Wilhelm Lund, who worked in Brazil from 1824 to 1829, financed by the King of Denmark. After excavating and extensively studying the fossil fauna from limestone caves in Lagoa Santa, Minas Gerais, Lund sent his collection to the Copenhagen Museum of Natural History, thereby concluding his scientific mission. Having fallen in love with Brazil, in 1834 he settled for good in the country, where he died many years later. In 1840 he described the human bones from Lapa do Sumidouro, Minas Gerais in *Memórias* (Lund, 1950). The skulls caught his attention due to their less “mongolized” shape as compared to those of other Native Americans, and they immediately sparked the first debates on the peopling of America (Souza et al., 2006).

Attuned to the work in Europe, Peter Lund observed several paleopathological characteristics, highlighting the intense wear on the teeth, tooth loss in life, and signs of presumed skull fractures. He used these characteristics to defend the position that this was ancient material, representing a group with an extremely primitive way of life (Lund, 1950). These were probably the first paleopathological reports on Brazilian material. International experts were consulted to discuss these findings, including Rudolf Virchow, who had published his first news on paleopathology in 1856. Human paleopathological studies had begun during this period, launching the second phase in the general history of paleopathology (Armélagos, Mielki & Winter, 1971).

Craniology and craniometry were still the main targets of anthropological interest in Brazil during the following years. According to Luiz de Castro Faria (Faria, 2000), the first phase of anthropological studies in Brazil lasted from 1860 to 1910. Research groups were organized, encouraging archaeological and anthropological studies. Contacts with Europe were crucial for Brazil for both theoretical-methodological and ideological reasons. But health was still not a key issue for anthropology in Brazil. In North America as well, Ales Hrdlicka prioritized evolutionary studies, despite having published work in paleopathology (Buikstra & Beck, 2006). Although the first Brazilian physical anthropologists were also physicians and anatomists, there was little interest in diseases and a greater focus on evolutionary studies (Souza, Codinha & Cunha, 2006).

The Museu Real (Royal Museum) was founded in Rio de Janeiro in 1818 by King João VI and was maintained and improved in the late 1800s by his grandson, Emperor Pedro II. Academia and authorities already acknowledged the scientific importance of anthropology, and Emperor Pedro II hired the museum’s first anthropologists. Pedro II was an amateur geologist and Egyptologist himself, loved archaeology, and supported anthropological research, encouraging the organization and study of collections. Proud of the tropical country he ruled, Pedro II made it a point of honor to organize the first exhibit in Europe featuring the beautiful Marajó and Tapajós pottery from archaeological finds in the Amazon. This was the context in which anthropological studies were encouraged.

Brazil's Royal Museum (later renamed the National Museum) was not the institution that backed Lund in his work, but it was there that conditions were created for physical anthropology to flourish. Thus, unlike other countries, the study of ancient human remains in Brazil referred not only to a seminal name, but to a public institution that formally encouraged such studies, recruiting the proper experts for this project. Ladislau Neto, an archaeologist and first director of the museum, headed and promoted research in the area and led the first Anthropological Exposition in Brazil.

The first physical anthropologist at the National Museum was João Baptista de Lacerda, also a physician. He was in charge of the Section on Anthropology, General and Applied Zoology, Comparative Anatomy, and Animal Paleontology beginning in 1870, heading a laboratory on experimental physiology, where the science of physical anthropology was conducted at the time. He was the first Brazilian to describe the skulls from Lagoa Santa and raise the hypothesis that current Brazilian indigenous peoples were their descendents. Lacerda focused little attention on the skulls' pathological aspects, but his evolutionary metric studies were important. His publications included *Documentos para Servir à História do Homem Fóssil do Brasil* in 1875, in *Mémoires de la Société d'Anthropologie de Paris*, and he lectured at the first course on Physical Anthropology in Brazil, in 1877 (Faria, 2000).

João Rodrigues Peixoto was an assistant to João Baptista de Lacerda. Despite his interest in investigating differences between the skulls of the *sambaqui* builders and those of contemporary indigenous peoples, referred to generically as "Botocudos", he also failed to focus great attention on health aspects. The Botocudos were considered extremely primitive and stereotyped as indocile, serving as a morphological parameter for primitivism.

Using craniometric and cranioscopic techniques prevailing in Germany and France at the time and equipped with imported instruments, anthropologists at the National Museum worked on these materials. By classifying skulls, they attempted to situate each group or individual in the evolutionary landscape. Although they still showed little interest in paleopathology, they established collections represented by Brazilian and international materials, thereby ensuring the diversity of a collection which even today is the object of paleopathological studies.

At the turn of the 20th century, Brazil was undergoing great changes resulting from the Proclamation of the Republic (1889). New objectives and new discourses emerged, and the Royal Museum became what it is today: the National Museum of Rio de Janeiro. After a phase of abandonment, this institution, heir to the collection and academic dreams of the Empire of Brazil, steadily reclaimed its role. At the time there were no other Brazilian institutions with specialists in the study of human skeletons, particularly archaeological ones. The National Museum acted for a long time as the national repository of collections, although the Ipiranga Museum in São Paulo and the Emílio Goeldi Museum in Belém, Pará, also maintained collections (Souza, 1991).

According to Castro Faria, the second phase of physical anthropology in Brazil began after 1910. During this phase there was little interest in the study of archaeological materials, with a shift towards the theme of ethnic miscegenation and its relations with the formation of the Brazilian people (Santos, 2002). Somatometry and somatology gained ground, and the study of bones became temporarily less relevant. The study of Negros, Mulattos, and contemporary Brazilians became the focus of greater interest, replacing that of indigenous peoples and archaeological collections.

A leading scholar at the time was Edgar Roquette-Pinto, an ethnographer who organized the second course on physical anthropology in Brazil, in 1926. He also chaired the First Eugenics Congress in 1929 and published *Rondônia*, with a rich Nambikwara ethnography. This study resulted in some information on health that ended up feeding one of the most interesting Brazilian dissertations in paleoparasitology (Fonseca Filho, 1972).

Anatomist Álvaro Fróes da Fonseca, one of Roquette-Pinto's assistants, also played an important role in the ongoing development of bone sciences in Brazil. Fróes da Fonseca lectured at the Federal University, becoming professor

of anthropology at the National Museum. The following generation of anthropologists knew him as a reference in morphology and studies on anatomical variability, which he consistently taught in his medical curriculum.

Although anthropology continued to receive important medical contributions in the early 20th century, paleopathological studies failed to spark interest in Brazil. Meanwhile, scientific output was growing in other countries, especially through contributions from countries in the Northern Hemisphere, but also some in South America. According to a compilation by Armelagos, Mielki & Winter (1971), over the course of the 19th century some 180 studies were published in paleopathology, while in the early 20th century, from 1900 to 1930 alone, another 560 titles were published. These figures, although approximate, confirm the field's full-blown growth, although without any apparent impact on Brazilian anthropology.

In the 1920s and 1930s, archaeological research missions from the National Museum mobilized anthropologists, providing new materials and questions for discussion. The first and most noteworthy were revisits to the sites at Lagoa Santa, headed by Padberg-Drenkpöhl in 1926 and José Bastos de Ávila and Ney Vidal in 1937. Bastos de Ávila, a physician, dedicated himself mainly to anthropometry, but also contributed occasionally to the study of the skulls from Lagoa Santa and other archaeological sites. Reinforcing the teaching of quantitative methods applied to anthropological research, he organized the third course in 1932 and published the first Brazilian technical manual, *Antropologia Física* (Ávila, 1958).

In the mid-20th century, World War II affected the Americas as a whole, and Brazil was no exception. After the war ended, Brazilian institutions resumed their activities, and a major academic restructuring occurred. During this period the dichotomy between life sciences and the humanities was momentarily attenuated by the inclusion of courses on physical anthropology and human evolution in the humanities. According to Castro Faria (2000), during this period some 40 courses in anthropology were offered at different universities in the country. But courses that depended on biological knowledge for studies in the humanities meant a huge effort, with little return in practice, due to the difficulty in training researchers in the more biological dimensions of anthropology.

Two figures were active at the National Museum in the late 1940s: Tarcísio Torres Messias, a career staff technician at the institution who conducted studies on skeletons of *sambaqui* builders, and Pedro Estevam de Lima, physician, anatomist, and dentist, attracted by anthropology. Pedro Lima became a staff naturalist at the museum and devoted 16 years of research to indigenous groups, conducting anthropometry and pioneering studies, including indigenous health. Both contributed to the formation of bone collections at the National Museum, and to a more modest degree, to paleopathology. Both also reported observations on health-related and cultural practices, such as dental mutilation (Lima, 1954). Lima was probably also one of the first to exhume bodies from cemeteries of the Guajajara-Tenetehara people for scientific purposes, with this indigenous group's help and support. The skeletons, which were considered contemporary at the time, provided isotope dates nearly two and a half centuries old. Their paleopathological study has provided valuable bioarchaeological information.

This same period also witnessed the first systematic Brazilian and international excavations in various Brazilian archaeological sites. Lagoa Santa was revisited by Wesley Hurt of the University of South Dakota, together with colleagues from the Brazilian National Museum. The *sambaqui* at Cabeçuda, Santa Catarina, was excavated by Castro Faria, who began his career as a paleoanthropologist at the National Museum. At this time, the first important collections of archaeological human skeletons were formed, which encouraged the study of human bones.

The increase in the number of excavations, the expansion of archaeology and prehistory in academic institutions, and the new legislation on protected heritage sites fueled the field's growth in Brazil. However, this situation was

affected by changes resulting from the military coup in the 1960s and their impact on the country's anthropological scenario (Souza, 1991; Funari, 2002).

The first great modern paleopathology studies were published in the 1960s, establishing a new paleoepidemiological paradigm. The proposal of comparative population studies segmented by age, sex, and temporal, geographic, and cultural characteristics had begun with Ernest Hooton, who studied the Pueblo of North America (Hooton, 1930), but without major repercussions at the time. In the 1950s and 60s, Lawrence Angel resumed these approaches for discussing the health of ancient Mediterranean peoples (Angel, 1967). By applying these same population approaches, Angel made the initial leap to modern paleopathology and was followed by an entire North American school (Buikstra, 1990).

Meanwhile, in different states of Brazil, archaeologists João Alfredo Röhr in Santa Catarina and Dorath Pinto Uchoa in São Paulo conducted their excavations and published descriptions (albeit simplified) of ancient human skeletons. They included paleopathological data such as the description of dental caries, abrasion, and calculus, and some macroscopic bony lesions like healed fractures. Although lacking the kind of specialization that would have allowed them to accompany what was already being developed by experts outside of Brazil, these Brazilian archaeologists and anthropologists made their contribution to studies on prehistoric health. The first review of the Brazilian literature that compiled dispersed paleopathological data was presented at the International Congress of Anthropological and Ethnological Sciences in Chicago in the 1970s (Souza & Ferraz, 1974). Resulting in a limited systematization, this review showed how much work remained to be done.

During this same period, after years of contributions to somatometry, physical anthropology at the National Museum resumed its role of formulating models and interpretations of Brazilian prehistory. Through increasing dialogue with archaeologists, osteological studies gained new importance, while also opening room for paleopathological studies. Marília Carvalho de Mello e Alvim was the main figure in this transition. Having graduated in geography and history in the 1950s, Marília was first attracted to ancient history and later to ethnography (Powell et al., 2006) and eventually focused mainly on the osteometric and osteoscopic study of prehistoric skeletons. Searching for the biological relations among prehistoric populations as a way of understanding the peopling of Brazilian territory, she became the principal reference in the area for some 30 years, reviewing old hypotheses and new interpretative proposals for the human skeletons of Lagoa Santa and the Brazilian *sambaquis*.

Marília Alvim contributed more to paleopathology than her predecessors or contemporaries. Her work, some of which published with paleopathologists, frequently mentioned relevant data for studies on health. She authored several pioneering observations such as the impact of *batoques* (lip plates) on the mandibles of the Botocudos (Alvim, 1963). She was entirely devoted to human osteology and provided the exception confirming the rule that training physical anthropologists in courses in the humanities was very difficult.

Although she visited numerous archaeological sites and worked with many archaeologists, she did not conduct excavations, but was essentially a laboratory researcher. Her most important contribution was the painstaking study of cribra orbitalia and porotic hyperostosis in the skulls of *sambaqui* builders and other groups (Alvim, Uchoa & Gomes, 1991). Although she remained cautious in studies on paleopathology, since she considered herself insufficiently qualified to work in a field in which she lacked specific training, Marília produced highly relevant data for bioarchaeological studies.

Although she was not very scientifically daring, she seriously questioned the model of *sambaqui* builders as essentially gatherers and eaters of shellfish, against which she used an irrefutable nutritional argument. As an anthropologist at the National Museum and professor at the State University of Rio de Janeiro, she participated directly

or indirectly in training the current generation of senior Brazilian researchers in the area. Together with Cleber Bidegain Pereira (University of Santa Maria, Rio Grande do Sul), she published the first *Manual para Estudos Cranométricos e Cranioscópicos* in Portuguese (www.cleber.com.br). A second book, on bones other than skulls, containing a chapter on paleopathology, was awaiting publication when she died in 1995 and still remains unpublished. She opened the collections of the National Museum to different researchers, as for the first Brazilian thesis on bone paleopathology, by Jorge Ferigolo, under her supervision (Ferigolo, 1987).

Another figure that contributed substantially to paleopathology in Brazil beginning in the 1970s was Lilia Cheuiche Machado, a student and collaborator of Marília Alvim. Her main affiliation was with the Institute of Brazilian Archaeology, also in Rio de Janeiro (Powell et al., 2006). Dedicated to bioarchaeological studies, Lilia was one of the first to take interest in bone and dental paleopathology. She did an internship at the Smithsonian Institution in Washington, D.C., and worked with Douglas Ubelaker, Jane Buikstra, and Christy Turner II. When she returned to Brazil in the 1980s, she brought new methodologies and unprecedented results from the paleopathological perspective. She applied scanning electron microscopy for the first time to studies of dental abrasion, allowing the proposal of new interpretations on diet and economy in a prehistoric group on the coast of Brazil (Turner II & Machado, 1983; Machado, 1984). She introduced Brazil to the use of cortical bone histology to estimate age in adults and paleodemographic studies based on life tables (Machado, 1984).

Lilia, like Marília, had no medical training, making her interpretations and analyses more timid. She was an equally important reference for Brazilian archaeologists, maintaining close relations with the first teams specializing in paleopathology at the Oswaldo Cruz Foundation (Machado et al., 1984).

Walter Neves was another anthropologist who began his work in the 1970s. Together with Lilia, he represents the first generation that trained abroad, returning with the experience of internationalization, new paradigms, techniques, and methods that reinforced his scientific and academic contribution. Both Lilia and Walter participated in the transition to a scientific osteology that was more attuned to the new theoretical frameworks, influenced by the New Anthropology. Breaking with the relative professional isolation of bioarchaeological studies in Brazil, both scholars made key contributions to studies on the health of prehistoric Brazilian groups. Although neither specialized exclusively in paleopathology, the two researchers moved more easily than their predecessors in the expanded field of studies on human skeletal biology.

Walter began his studies at the University of São Paulo's Institute of Prehistory, further developing his training in osteology in the United States. For more than two decades he has focused mainly on microevolutionary studies (Neves, Hubbe & Piló, 2007). He made his pioneering contribution to bioarchaeology in the 1980s, while studying the materials from the Le Paige Museum in San Pedro de Atacama, Chile, especially the periods that preceded, accompanied, and succeeded Tiwanaku rule over the Atacama peoples.

In Brazil, Walter set up and maintained for years a new research center in bioanthropology at the Goeldi Museum in Pará. Settling later in São Paulo, he created the Laboratory for Human Evolutionary Studies, where he conducts research and supervises graduate students, but without totally abandoning paleopathological themes such as dental caries (Neves & Kipnis, 2004) and stress indicators (Neves & Wesolowski, 2002). Having always preferred to work with quantitative methodologies, his contribution to paleopathology has not prioritized osteobiographic approaches or differential diagnosis.

Alfredo Mendonça de Souza (Souza, 1988) published a scientometric study on Brazilian archaeology in the 1970s and 80s, calling attention to the country's relative isolation in terms of research output in archaeology, which he considered numerically limited and often provincial and unrefined. During the decades described by Souza, the

situation was beginning to change, including some growth in paleopathology. According to Souza, despite the small number of researchers studying human remains in Brazil, some 15% of the studies published during this period were already on bioarchaeology. Of these, 6% focused on paleopathology. This proportion sounds surprising if one considers the incipient nature of bioarchaeology as a field. It reflects the new impetus in research output on human remains. By focusing on authors and published themes, this same study shows that in parallel to the accumulation of traditional academic institutions, some studies in paleopathology were already starting to appear elsewhere, including a decisive contribution by physicians.

The emergence of paleopathology as a professional specialty in Brazil originated in three different and independent places, all in Rio de Janeiro. The first center to produce research in paleopathology in the 1960s was led by Ernesto de Mello Salles Cunha, a professor of dental pathology at Fluminense Federal University (UFF). Devoting years of study to archaeological skulls, he published the first specialized work on paleopathology in Brazil. He studied and painstakingly described the dental conditions of the series from Lagoa Santa and some *sambaquis* such as Cabeçada, in Santa Catarina. He developed the dental pathology models that allowed Brazilian archaeologists to characterize such groups in prehistoric interpretations. He was the first to call attention to the exceptionally good dental conditions and absence of caries in some prehistoric coastal sites, raising the hypothesis that genetic factors linked to the development of enamel could explain this rare condition (Cunha, 1963). Having personally conducted excavations in different sites, he built collections and even organized a museum at the Dentistry School in Niterói, Rio de Janeiro State. He studied the teeth of slaves and discussed African cultural practices such as dental mutilations (Cunha, 1968), Tupi-Guarani burials (Cunha, 1960), and other archaeological findings. His studies include biocultural interpretations, correlating dental conditions, daily habits, cultural practices, and diet. He was a key reference for Brazilian archaeologists and osteologists like Marília Alvim, and his work continued to influence other researchers after his death in 1977.

The second independent center with research and training in paleopathology was the undergraduate course in archaeology, functioning initially at Faculdade Marechal Rondon and later at Faculdades Integradas Estácio de Sá. Created in the 1970s based on a proposal for an initial basic curriculum for undergraduate studies in archaeology in Brazil, this course filled a gap in professional training in the country and produced several real innovations in the field. In the original curriculum, two particular disciplines provided impetus for the field of bioarchaeology: anthropometry and paleopathology.

Proposed as a discipline within the basic curriculum in keeping with international models, paleopathology was promoted by Alfredo Mendonça de Souza. He personally participated in the first research efforts (Souza & Ferraz, 1974), which included encouraging me in my professional career. International publications by renowned authors like Marvin Allison, Calvin Wells, and Don Brothwell inspired the initial course contents. Supported by cooperation with Claudio Lemos, a medical pathologist at the Pathology Department of the Rio de Janeiro State Employees' Hospital [IASERJ] and with the "Bones Club", I conducted the first studies on prehistoric skeletons while obtaining my specialization degree in bone pathology. Claudio Lemos participated in the first research work, helping lay the groundwork for the course. I received a scholarship from the Brazilian National Research Council (CNPq) and supervision by Castro Faria and Marília Alvim at the Department of Anthropology at the Brazilian National Museum, opening the doors for research on the museum's large prehistoric collections.

The third center of paleopathology emerged in the largest health research institution in Brazil, the Oswaldo Cruz Foundation (Fiocruz), thanks to the vision of Luiz Fernando Ferreira, a medical parasitologist. Under the inspiration of Olympio da Fonseca Filho and Marc Armand Ruffer, a pioneering group was formed, determined to invest in a new field of research: paleoparasitology.

Followed by students who rose to the challenge of writing their theses and dissertations on human health in the past, such as Adaauto Araújo, Diana Maul, Ulisses Confalonieri, and others, Luiz Fernando laid the foundations for paleoparasitology. His group became one of the first in the world to study parasite eggs and larvae in coprolites. Aidan Cockburn, Mirko Grmek, and Arthur Aufderheide are among the non-Brazilians that supported this initiative from day one. From the beginning of their work, the group at Fiocruz established archaeological partnerships with the following: the School of Archaeology through collaboration with Alfredo Mendonça and myself; the Institute of Brazilian Archaeology with Ondemar Dias and Lilia Cheuiche; with André Prous at the Museum of Natural History at the Federal University of Minas Gerais; with Niéde Guidon at the Fundação do Homem Americano; and with Maria da Conceição Beltrão and Marília Alvim at the National Museum in Rio de Janeiro.

Originally created under the Department of Biological Sciences at the National School of Public Health (Ensp/Fiocruz) and later moved to the school's Samuel Pessoa Department of Endemic Diseases, the group received encouragement and access to archaeological material, developing a prolific line of research and professional training.

Unlike the other two centers, which lasted no longer than 15 years each, the group formed by Luiz Fernando Ferreira maintained its vitality. Pursuing the production of knowledge and multiplying a body of highly trained researchers, the group succeeded in responding to the challenges of a new interdisciplinary field, persisting for the last 30 years and becoming a national and international reference.

In the State of Santa Catarina, the dental bioarchaeology center created by Salles Cunha practically stopped producing research after his death, although it did inspire other experts such as Edson Medeiros de Araújo. Dental studies were gradually incorporated into studies by general paleopathologists after the 1990s. The center for general paleopathology, created within the archaeology course, gradually approached the paleoparasitologists at Fiocruz, particularly consolidating this exchange after the activities were closed at the School of Archaeology, also in the late 1990s.

Thus, from 1970 to the 1990s, intense academic exchange laid the foundations for paleopathology in Brazil. North America and Europe were also experiencing changes, with the speed-up in scientific output and the consolidation of some of the leading names in the field. The growth of new interdisciplinary fields applied to archaeology, a new approach to biomedical technologies, attention to biocultural questions, and other issues fueled the interest in studies on health and its relations to ancient ways of life.

Importantly, as in Brazil, the field of paleopathology in the Northern Hemisphere was also closely linked to medicine. According to a compilation based on the review by Armelagos, Mielki & Winter (1971), until the early 1970s only 15% of the publications in paleopathology were from the anthropological area, but this proportion began to increase slowly in the following decades.

Jarcho (1966) and others discussed the history of paleopathology, calling attention to its different phases or stages. They identify the initial phase of interest in fauna, the one focusing on human beings and some specific diseases or practices, and finally that of essentially pathographic diagnoses and the application of new techniques.

In Brazil, the interest in such themes and objects did not follow the same chronological order, and the main research thrust related to the more recent period, still not described by these authors. Several years later, Buikstra and Cook (1980), reflecting on this field of research in the Americas, highlighted the growing trends in paleoepidemiology. When Della Cook came to Brazil to give the first course on Specialization in Paleopathology at Ensp/Fiocruz, she provided Brazilian researchers with the conditions for the definitive expansion of this field in the country, while of course bringing a strong North American and paleoepidemiological influence. Her visit also strengthened the

association between faculty and alumni/ae from the School of Archaeology and the paleoparasitology group at Fiocruz, contributing definitively to the establishment of what is now a stable and productive research center at the latter institution.

PALEOPATHOLOGY: WHAT'S NEW ON THE HORIZON?

Having published its work since the 1970s and significantly increased its research output since the 1990s, the Fiocruz team currently collaborates with academic graduate studies programs in epidemiology, public health, molecular biology, and parasite biology that accept themes for theses and dissertations in paleopathology.

The group regularly offers a specialization course, in addition to participating in course content, ad hoc courses, conferences, events, scientific exhibits, and other activities, thereby fueling interest in the subject inside and outside of Fiocruz. Regular international cooperation with colleagues from Europe, the United States, and the Americas in general provides further impetus to the teaching and research work. Thanks to funding from Brazilian research agencies such as Capes and CNPq and specific international agreements such as Capes-Cofecub (Comité Français d'Évaluation de la Coopération Universitaire avec le Brésil) and Capes-SECyT (Secretaría de Ciencia y Tecnología), colleagues from abroad come to Brazil and Brazilian researchers and students travel abroad for collaborative studies and research work. Renowned experts such as Della Cook and Karl Reinhard (USA), Ricardo Guichon and Martín Fugassa (Argentina), Françoise Bouchet (France), Eugénia Cunha (Portugal), Bernardo Arriaza (Chile), and others have collaborated in projects. Although the course is situated in an institution of excellence in the medical field, interaction with anthropology and archaeology is reflected in both the research output and the profile of alumni/ae from our courses.

Contrary to predictions, the study of human remains continues to make progress in Brazil. There is already a demand for professional experts to provide consultancy and conduct temporary projects. Related issues such as studies in taphonomy and funerary archaeology are already themes for research, monographs, and theses, encouraged by the new undergraduate and graduate courses in archaeology. Bioarchaeological approaches have become more frequent, and specific projects have begun to receive funding. Ease in travel, funding for research, domestic and international cooperation, participation in events, more agile scientific output, and other factors have reduced the endogeneity, thereby contributing to the improvement of Brazilian research in paleopathology and to the contribution by Brazilian experts to international paleopathology (Souza, Codinha & Cunha, 2006; Lessa, 2006). New methodologies and techniques developed by Brazilian experts are accepted and applied elsewhere in the world. Biocultural models, some unprecedented, are contributing effectively to a better reconstitution of Brazil's prehistory (Lessa & Scherer, 2008; Rodrigues-Carvalho & Souza, 1998; Souza, 1992, 1995, 1999; Wesolowski et al., 2007).

In the early 21st century, bioarchaeology has been increasingly incorporated into archaeological projects. The questions emerging from field or laboratory research are answered through multiple approaches and collaboration between disciplines. The specificity of preservation of materials, taphonomic processes, challenges in the medium- and long-term preservation of samples, and issues of curatorship are all present in paleopathological research. The inclusion of ethical issues related to studies of human remains, as well as the search for procedures that reduce invasive and destructive technologies, have already begun to be performed in bioarchaeological research. Part of the effort involves the adjustment of excavation projects and opportunistic and systematic collections by applying specific protocols for food microresidues, paleoparasitology, paleogenetics, and others, thereby ensuring better quality and

reliability in the data. Paleopathology is already a definitive part of archaeological research, making the invisible visible and reconstituting histories on health and ancient ways of life.

Currently, in various States of Brazil, groups of archaeologists have incorporated at least one temporary specialist dedicated to the study of human remains. Studies of human remains and the analysis of funerary structures, skeletons, and teeth have multiplied in the literature, gaining greater visibility in archaeological research. Some professionals from medicine and biology already work fulltime in this field, gaining professional expertise and adding techniques, experience, and interests to those of archaeologists, joining efforts to unveil the biological past of humans and their cultural relations.

The possibility of an association between radiologists, geneticists, dentists, biologists, physicians, parasitologists, anthropologists, historians, geographers, archaeologists, and others is now a much richer and more complex interdisciplinary reality than could have been imagined by Castro Faria or others who conceived the field of anthropology as an encounter between biology and the humanities. Ever since the skulls with dental wear called attention to health, all the way to the current painstaking studies on diet through microscopic food residues from dental calculus, we have come nearly two centuries on our research journey in paleopathology in Brazil.

The main researchers currently working in Brazil and who received their basic training in osteometry (osteology), including knowledge on epigenetic traits, are prepared to conduct basic studies on mortality and osteobiographic identification, and depending on their backgrounds, they focus on different areas of paleopathology with varying degrees of specialization.

Meanwhile, professionals that specialize mainly in microevolutionary research, conducting osteometric studies, also have experience in basic research in paleopathology. In practice there has been extensive integration between these two fields of bioarchaeology. Archaeologists and other professionals trained in the humanities have been receiving their training in medical institutions such as Fiocruz in Rio de Janeiro, thus benefiting from a rich and perhaps unanticipated interdisciplinary interface.

Professionals originally trained in the biomedical specialties have also participated increasingly in archaeological work, from the field to the laboratory, with greater presence in the institutions housing collections and in the anthropological laboratories, establishing more balanced and interdisciplinary work relations. Joint efforts in the last 15 years have ensured the growth of paleopathology in Brazil. An intense network of cooperation between researchers from biomedicine and the human sciences (both Brazilians and non-Brazilians) has worked on themes and problems of common interest, thus fostering progress in the field.

The main Brazilian centers for training and research in paleopathology are still in Rio de Janeiro and São Paulo, but smaller groups (originally spinoffs from these centers) are working in other places and institutions to ensure the continuity of their work, while considerably decentralizing the field's knowledge output.

The interests are more diversified at Fiocruz, including morphological, molecular, and immunological paleoparasitology, with studies ranging from taphonomy to oral health conditions and diet, thereby multiplying the group's scientific potential. Participation by teams of experts from the Oswaldo Cruz Institute have allowed maintaining these lines of research and opening new ones, accompanying trends in other centers or even innovating in techniques and themes. The following is a list of names from both Fiocruz itself and individuals from other institutions that are associated with the Foundation's research groups in paleopathology and paleoparasitology: Aduino Araújo, Alena Mayo Iñiguez, Sheila Mendonça de Souza, Luciana Sianto, Daniela Leles, and Andréa Lessa, among others. Some

of these, alumni/ae of Fiocruz, have created new research groups, for example Claudia Rodrigues Carvalho (National Museum, Federal University of Rio de Janeiro), Verônica Wesolowski (Museum of Archaeology and Ethnology, University of São Paulo), and Olívia Carvalho (Federal University of Sergipe), among others. A relevant number of theses and dissertations and more than 300 publications on paleopathology have thus emerged in the last 20 years.

Other research centers in Rio de Janeiro have proceeded with or launched their own work. At the Institute of Brazilian Archaeology, Laura da Piedade Ribeiro and Gláucia Malerba Sene continued the line of research work by Lilia Cheuiche. In the Department of Anatomy at the Federal University in Rio de Janeiro, Adilson Salles, following the tradition of anthropological anatomists, has been conducting and supervising studies on osteology, mummified materials, and paleopathology, in collaboration with Fiocruz and the National Museum. Jorge Ferigolo, with a small team, has done similar research at the Rio Grande do Sul State Zoobotanical Foundation.

At the University of São Paulo (São Paulo city campus), three groups affiliated with different research centers are producing research in osteology, funerary archaeology, human evolution, and paleopathology. At the Institute of Bioscience, Walter Neves and Sabine Eggers lead their research groups, training Master's and PhD students on different topics. Graduates of these centers include Max Hubbe, Mercedes Okumura, Célia Boyadjian, and Pedro Tótor da Glória, among others.

At the Museum of Archaeology and Ethnology, new PhDs like Sérgio Francisco da Silva conduct part of their research in paleopathology. In Belém, Pará State, at the Federal University of Pará, the group led by Andrea Kelly Ribeiro-dos-Santos and Sidney Santos, at the Laboratory of Medical Genetics, does research in human and parasite paleogenetics, having studied samples from practically all over Brazil.

Some of the research themes in paleopathology include: violence and conflicts between prehistoric human groups in Brazil and Chile and their relations with cultural transitions and contacts; economic, dietary, and health changes; the distribution of infections and their demographic relations; migrations and changes in the prevalence of human parasitic infections; musculoskeletal changes and daily activities; dental problems and diet; and congenital anomalies and their genetic and environmental determinants. Brazilian researchers in all these specialties participate in events in Brazil and abroad and produce studies on materials from Brazil and also from other countries including the United States, Chile, Portugal, France, Belgium, and Argentina.

The approach to paleopathology in Brazil began with skulls and eventually reached parasites, opening up a wide range of research in the last two decades. Medicine, which played an important role in the first phase of physical anthropology, when paleopathological approaches were still taking their early steps, remained as a sort of reserve for anthropological training for many years. The consolidation of the first studies on human evolution in the humanities in the 1960s laid the basis for the first non-medical callings in bioarchaeology. During this same period, within the various medical specialties, new perspectives motivated studies on health and disease in ancient populations. An international scenario ripe with archaeological and anthropological studies began to influence Brazil and motivated these parallel developments.

Today, the training centers for experts in paleopathology in Brazil are mainly based in the biomedical field, although extensively permeated by anthropology. Most of the professionals with their main specialization in paleopathology no longer have basic biomedical training, but originally graduated in archaeology or other human sciences. The process that began in the mid-20th century finally appears to have come full circle, although by unforeseen paths.

This increasing interdisciplinary collaboration suggests that we may be approaching what Castro Faria would have liked to witness during the early efforts to introduce physical anthropology into teaching of the humanities. News

challenges continue to emerge for researchers, teachers, and students of human remains, but the situation in the early 21st century is certainly promising. The field's growth already allows us to refute Marília Alvim, who bemoaned during her more pessimistic phase, "Anthropologists that study human bodies are a dying species in Brazil."

It's not true, Marília! Even having traveled unforeseen roads, bioarchaeology and paleopathology are alive and well in Brazil!

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