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Paleonotology in Peru: just beginning

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SUMMARY

Although Peruvian fossils have been known from the early days of the Spanish conquest, the indigenous development of paleontology was very poor until the early twentieth century, with some remarkable exceptions like the work of A. Raimondi and of C. Lisson. The subsequent growth of paleontology in Peru was principally in invertebrate paleontology because of its utility in mining and hydrocarbon exploration. Previous to the 1970´s paleontological work was almost exclusively carried out by foreign specialists, but after the 1980´s Peruvian paleontologists have taken the preponderant role.

There are currently five centers developing paleontological projects: Paleontology Department at Natural History Museum of San Marcos National University (DP-UNMSM), Peruvian Institute of Paleovertebrate Studies (IPEP), Paleontological Institute at Piura National University (IP-UNP), Laboratory of Paleontology at Ricardo Palma University (LP-UNRP), and Museum of Paleontol-

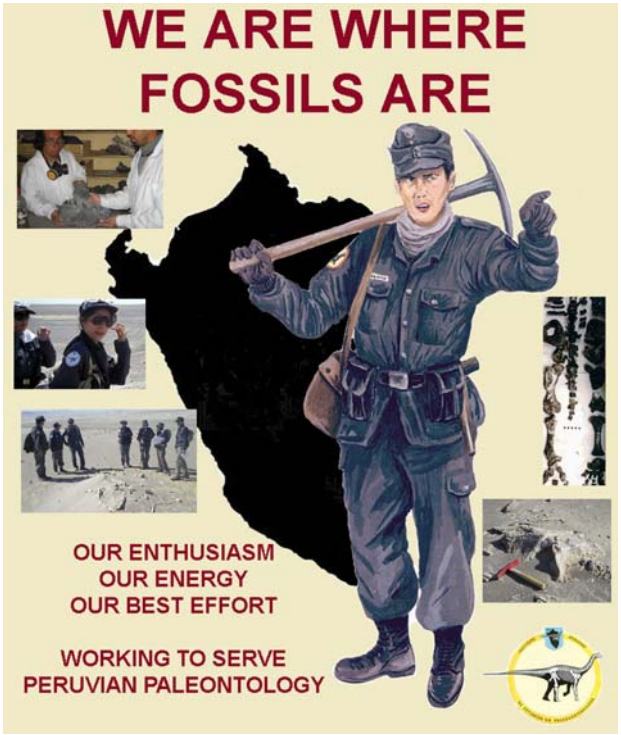

FIGURE 1. An institutional promotion poster, a sample of Peruvian paleontology's rising generation.

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ogy of Puno (MPP). They are engaged mainly in research but also, to varying degrees, in outreach, teaching and museographic activities. Current job availability for paleontologists is almost exclusively limited to these institutions.

The main challenges in today´s Peruvian paleontology are the absence of formal, college-level curricula, the scarcity of local research centers; limited funding sources, and the lack of an effective law for protection of our paleontological heritage.

FIGURE 2. Antonio Raimondi.

FIGURE 3. Carlos Lisson.

A BRIEF HISTORICAL INTRODUCTION

Fossils come into play very early in Peruvian history. As early as the fourteenth century there are records of people living in lower Ica Valley settlements who used large fossilized whale vertebrae as pestles (*batan*, in local language). This use was not sporadic or casual; several of those pestles have been found, so it is clear that vertebrae were expressly sought for that purpose.

When the Spanish conquerors came to this land, they heard many stories about giant creatures that had lived here. In these stories the giants were often evil and vicious and many of them ended their lives destroyed by the gods. These tales were supported by the existence of giant bones in barren places, such as those seen by the Spanish in the arid Northern borders of the Inca Empire. The meaning of these remains led to a long-lasting controversy among colonial scholars. Of course, these bones were not part of a giant´s massacre but were Late Pleistocene megafaunal assemblages, where most of the huge “human bones” belonged to mastodonts and megatherine ground sloths.

The early development of paleontology as a formal science is closely associated with Peru. Cuvier´s descriptions of the *Megatherium* in *Recherches sur les Ossemens Fossiles* (1836) are accompanied by notes about a supposed skeleton of this gravigrade which was to be shipped from Peru. There are no records, however, of its arrival in Spain, so the specimen is currently lost. In his notes on the mastodonts, Cuvier mentions Peru again when speaking on “mastodontes des Cordilléres” (later named *Cuvieronius*), pointing out that some of known remains were collected by Dombey in this country.

After Cuvier, the first half the nineteenth century saw a very little development of paleontology in Peru. References about Peruvian fossils are found in d´Orbigny (1835-1847) and later by Gervais (1855). The second half of the century, however, witnessed the work of Antonio Raimondi, an Italian-Peruvian geographer and naturalist, who can be regarded as the founder of Peruvian paleontology (Figure 2). Raimondi published several detailed descriptions of fossil invertebrates, gave the first reports of fossil cetaceans in the Southern deserts, and recorded mastodont bones from the Western Amazonian basin (1898).

A key milestone in Peruvian paleontology is the work of Carlos Lisson (1868-1947; Figure 3).

FIGURE 4. Unearthing a fossil cetacean in Middle Miocene beds of the Ica Desert, southern Peru.

Basically a geologist, but with a deep interest in fossil vertebrates and invertebrates, Lisson devoted great efforts to compile existing information on local fossils and also described several new finds. Apparently discouraged by obstacles such as lack of support and resources for his work, there is evidence that he tried (unsuccessfully) to leave the country, as attested by letters sent to Florentino Ameghino (then Director of the National Museum of Buenos Aires) asking for a job, and offering to transfer to the museum his personal collections.

The first half of the twentieth century saw the expansion of mining and the search for petroleum resources. It was therefore unavoidable that new fossil finds would come from field work by geologists and other explorers, especially those surveying in the Eastern slopes of the Andean range and in Amazonian Basin. The best example of these may be the collection made by Harvey Bassler (1883-1950), an American geologist who made an extensive survey comissioned by oil companies and the Peruvian government. The Bassler colection (whose systematic description was made by B.Willard in 1966) includes large numbers of plants, invertebrates and vertebrates from Mesozoic and Cenozoic ages, collected mostly from Eastern Peru. This collection was deposited at Lehigh University and is now in the Smithsonian National Museum of Natural History.

Along the coastal strip, many important discoveries were made beginning in the 1940´s, noticeably in the Southern deserts along regions of Ica and Northern Arequipa where extensive Cenozoic outcrops began to reveal huge numbers of fossils (Figure 4). Other significant studies were started on Northern sites, particularly over the Sechura desert and neighboring areas. Like those in the Eastern region, these works were closely

related to geological surveys for mining but also with agricultural projects.

Up to this point invertebrate paleontology in Peru developed faster than vertebrate paleontology, due to the expansion of geological investigations using invertebrates and microfossils, in turn linked to the growth of mining and oil exploitation. By contrast, research in vertebrate paleontology remained at very low levels until the late 1960's, clearly related to its lesser potential to directly support economic activity and the scarce general development of sciences in Peru.

Vertebrate paleontology was decisively boosted by French paleontologist Robert Hoffstetter´s work in the late 1960´s. Hoffstetter made several studies on vertebrate-bearing sites, noticeably that of Sacaco, a very rich Neogene site on our Southern coast. A Hoffstetter student, Christian de Muizon, arrived some years later and his efforts, started in the late 1970´s, gave a strong impulse to the development of vertebrate paleontology in Peru. Muizon´s research developed through two decades, delivering several substantial studies on local vertebrates, focusing on Neogene marine faunas from the coastal deserts.

Up to the 1970´s, despite its growing importance, paleontological investigations in Peru were driven by foreign researchers. This shouldn´t be surprising, since we lacked, and still do, a formal career path in the discipline. But things have changed since the late 1980´s, when local students began to develop a domestic paleontology.

CURRENT STATUS OF PALEONTOLOGY IN PERU

Teaching

There are no university degrees in paleontology in Peru. Within the existing curricula of biology, geology and to lesser extent archaeology, there are limited courses about paleontology or evolution, but these are very general and have a largely outdated content. As a result, the university education of a specialist in paleontology still requires the student to study in foreign countries, usually the U.S., France, Argentina or Brazil, either as an undergraduate or at the postgraduate level.

Training of Peruvian biological scientists suffers from an overemphasis on neontology, with little importance given to evolutionary or palaeontological aspects. Those courses within the degree dealing with paleontology, evolution or historical geology have very simple content, are much too short, and the instructors are not specialized in paleontology-related fields or do not have access to current information.

Degrees in Geology (which in Peru are included in Engineering) also include paleontology courses, but these are focused in the use of fossils as indicators in the search for mineral deposits or hydrocarbons. The dominannt criterion is the proper identification and accurate descriptive of guide-fossils.

For those without opportunities to get a college education in foreign countries, there is the chance for a practical, experience-based learning in one of the existing paleontological research centers in Peru. Many students who cannot complete degrees in paleontology follow instead programs in biology, archaeology or geology, and upon graduation come to these centers to apprentice alongside trained specialists.

There are, however, ongoing projects to set up teaching centers for paleontology at the university level. The most important is headquartered in UNASAM (National University Santiago Antúnez de Mayolo) in the Andean city of Huaraz. It is planned to start a master´s degree in Paleontology between 2013-2014, with participation of foreign teachers and financial support by the UNASAM Faculty of Sciences and Antamina Mining Company.

In addition to UNASAM, there is at least one similar project to establish a degree program, at the Ricardo Palma University (Lima). This program is in a very incipient state of development.

Employment

A paleontologist in Peru is most likely to find a job in applied aspects of his or her speciality, where paleontology is useful as a service to as mining or oil exploration. This somewhat increases job prospects for invertebrate paleontologists and more significantly for micropaleontologists.

Another option for a job is university teaching. But the absence of paleontological degree program in Peru means that the only positions as teachers are for courses related to the subject in Faculties of Biological Sciences, Geology or Archeology.

Regarding research careers, opportunities are few, this being tied to the scarce support given in Peru to scientific research, both by government and private entities. However there are already some institutions fully devoted to paleontology, where the growing increase in the number of research projects allows them to offer jobs for the newcoming paleontologists.

FIGURE 5. *Scelidodon chiliensis* skeleton in Exhibition Hall of UNMSM Museum.

Centers for Developing Paleontogy

There are five centres or entities currently developing paleontological work, mostly for the purpose of research.

The Department of Paleontology of the Museo de Historia Natural at Universidad Nacional Mayor de San Marcos, a government branch, has carried out intensive research work since the early 1990´s. The chief credit for this development belongs to paleontologist Rodolfo Salas-Gismondi, a skilled researcher who improved the Department, until then largely inactive and subordinated to geology and with its work almost exclusively limited to invertebrates. Among the main achievements of this team are important advancements in knowledge of Peruvian fossil vertebrates from the Palaeogene of Bagua and Moquegua, the Neogene of the Amazonian Basin and Ica, and Pleistocene fills in several caves in the Andean highlands (Figure 5). Just as remarkable is how the DP-UNMSM has brought together many students of various backgrounds that are interested in paleontology, enabling them either to learn about the subject or to participate in its projects. DP-UNMSM has also important links with foreign research institutions (mostly French), which provide it with technical aid and funding.

The Instituto Peruano de Estudios en Paleovertebrados (IPEP) is a non-profit, non-government institution founded in 1995 by Carlos Vildoso and his wife Patricia Sciammaro, both paleontologists. They are trying to build a scientific center, focused on vertebrate paleontology, without the risk of being affected or influenced by those pressures so frequent (often for political reasons) in state organizations. IPEP has for many years attracted students interested in vertebrate paleontology, giving them both a job and a place for learning. In its early development (1995-2004) IPEP gave priority to exhaustive fieldwork and remote surveys, with the purpose of building a complete database and mapping of Peruvian fossil sites, assembling a representative collection from these, thus creating a useful frame for later work. Later studies focused principally (Figure 6) on Mesozoic vertebrates (Early Cretaceous of Conchucos and Latest Cretaceous of Bagua) and in lesser degree on Cenozoic ones (Paleogene of Tacna, Neogene of Ica, Andean Pleistocene). A remarkable fact is that IPEP publishes since year 2009 the only Peruvian journal devoted to vertebrate paleontology, *Contribuciones Paleontológicas*, a quarterly publication.

A key factor in the development of IPEP was building a solid strategy for financial support without using government or foreign funds. This was achieved by such activities as itinerant exhibitions in schools and universities, merchandising of educational materials, and technical cooperation with private companies (like those in mining) whose work takes them in close contact or interaction with paleontological materials.

FIGURE 6. Early Albian theropod tracks, discovered at 4600 meters above sea level in Ancash. (Courtesy Antamina Palaeontological Project).

There is also the Laboratory of Paleontology at Universidad Ricardo Palma (LP-URP), in Lima. This center was stablished and developed mostly by the personal efforts of Dr. Vera Alleman, a well known paleontologist who devoted several decades to assemble a significant and valuable collection of fossils (mostly invertebrates and plants). She has also published many important papers on different paleontological issues. Dr. Alleman´s current efforts go towards giving the LP fossils a genuine museum status, incorporating significant materials like the large Hönninger Collection, an itinerant private paleontological exhibition created in 2009 by Klaus Hönninger.

Another research center arising in these last years is the Institute of Paleontology at Universidad Nacional de Piura (IP-UNP), a state university. The Institute of Paleontology was founded in late 1990's by Dr. Jean-Noel Martinez, a French-born researcher now established in Peru. IP-UNP primarily works on the rich Pleistocene sites of Northern Peru, with several published studies about local megafauna. Their collections comprise a remarkable number of specimens, including some fairly complete mammalian materials. The operations of IP-UNP deserve special mention because its development of joint projects with Ecuadorian researchers, having an active interchange of information and students.

In the Southeastern corner of the country, the Museum of Paleontology of Puno, founded in 1997, maintains a very important collection comprised mostly of Paleozoic invertebrates from that region, but also a number of younger materials including some vertebrates. The museum is largely the work of Professor V. Soto Condori, who met and formed a core of skilled researchers and technicians. Among its activities is an important program for paleontology-based educational outreach in the Puno area and the surrounding countryside.

Funding

A key source of funding comes from foreign agencies or universities by means of joint research projects with local institutions. Most of DP-UNMSM work gets financial support by those funds.

Local universities sometimes have a budget for research purposes. Although often noticeably smaller than foreign funds, they support some important projects. Good examples of this are the

University of Piura´s Institute of Paleontology, and the Laboratory of Paleontology at Univeristy Ricardo Palma.

Occasionally some projects get support from private companies. Those are usually short-term amd restricted to sponsored recovery, exhibition and media of fossils found in their area of work, sometimes when they dig for mining or building. For instance, in recent years the building of a natural gas pipeline crossing the Ica Desert cut through rich Neogene fossil-bearing beds, which moved the builders to finance the rescue of several exposed specimens.

An exceptional and paradigmatic example of a private company supporting paleontological work is that of Antamina Mining Company, in the Ancash Andean highlands. After discovery of large fossil-bearing outcrops in its area of influence, Antamina started development of a project where paleontology has a very strong support. Research maintains priority, but the growing knowledge about local paleontological resources gave birth to regional company-sponsored programs in educational outreach about fossils and related matters, preservation and public use of paleontological sites, and creation of jobs for local people based on rational exploitation (e.g. tourism) of paleontological resources.

Laws

A serious problem for Peruvian paleontology development is the lack of an effective law for the protection of fossils. Theoretically, since 2002 Peru has had a law giving formal protection to fossils and fossils sites. The Law for Protection of National Heritage includes fossil materials as part of the cultural heritage, but within the definition of “heritage” rests a misconception that affects fossils. In the law´s first lines we find “ National cultural heritage is every material or inmaterial **creation of human intellect**.” This clearly implies that only man-made or man-produced matter constitute cultural heritage. Fossils, not being made by man´s intellect, automatically fall out of the law´s range. Thus, even if later this law includes “paleontological objects”, after the above definition only paleontological objects made by humans (e.g. artificial) are ruled by this law.

Attempts are being made currently to repair this gap, pointing towards specific inclusion of fossils as part of biodiversity. In fact, laws regarding it indicate that both past and present biodiversity are under protection. Technically speaking, fossils should be included here as part of ancient biodiversity. The ongoing task is win the support of congressmen to make the right modifications or corrections in the laws. But this may take a very long time. In the meanwhile, there stays an open door for illegal trade, damage or destruction of fossils.

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