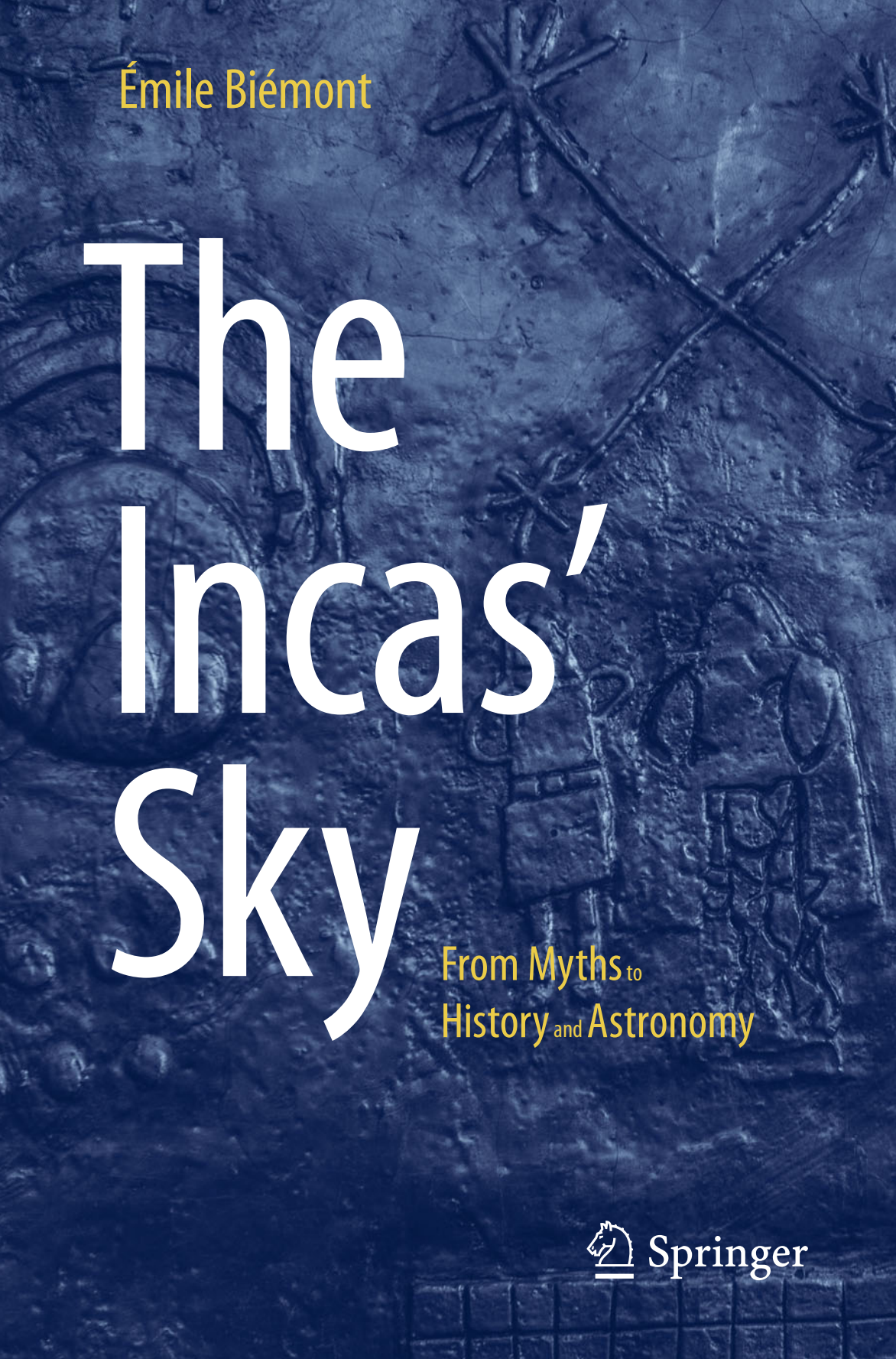
Émile Biémont
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From Myths to History and Astronomy
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Preface

Who would not be seduced and intrigued by the marvelous Inca civilization that developed in the Cuzco basin in the heart of present-day Peru? The Inca empire was one of the largest and most impressive in pre-Columbian America, stretching from Colombia to Argentina and Chile, and covering most of present-day Ecuador, Peru, and western Bolivia. And there can be little doubt that it would have survived for a very long time had it not been destroyed by the Spanish conquistadors under the orders of Francisco Pizzaro.

The Inca people developed their extraordinary civilization, reaching such a high level of achievement, without ever having known the wheel or writing. For some of us, this stirs an irresistible urge to find out more about their culture. A few years ago, during a memorable trip to Peru, I was lucky enough to discover some of the most grandiose sites in this beautiful country and see for myself some of the apparently eternal traces of this astonishing empire. These ruins could hardly fail to impress, not only the anonymous visitor who happens upon these places, but even the experienced archaeologist.

Who could contemplate the grandiose and mystical site of Machu Picchu and remain unmoved? It seems that few can. Even the gods would be tempted to reside there. Anyone lucky enough to discover the marvelous archaeological sites of the pre-Columbian cultures that survive today will be struck by the grandeur and nobility of the Inca civilization, as revealed by several written testimonies, many in the form of Spanish chronicles. But it is important to understand that this impressive empire, which developed in territories of striking contrasts that some would describe as "cursed by the gods", was the

culmination of the cultural contributions of a dozen astonishing and complex pre-Columbian civilizations that succeeded one another over the centuries.

This book first takes the reader on a guided tour of the climatic and geographical diversity of the regions where the Inca civilization took root. Then, through the testimonies of travelers, explorers, and archaeologists, and the writings of Spanish and Peruvian chroniclers, it presents the different cultures that preceded the Inca civilization, being careful to distinguish between its historical and mythical origins. Finally, we immerse ourselves in the spirituality and cosmology of the Inca people, built around their detailed and systematic observation of the sky, a common thread in the first few chapters.

The later chapters invite the reader to explore further the spirituality of the Inca civilization and understand how it relates to their observation of the sky and the practice of agriculture, so crucial to the survival of these populations. The history of the Inca people is characterized by an astonishing and omnipresent spirituality that cannot be ignored. They attributed a metaphysical power to many objects and places they considered sacred. These mystical places were deeply respected, particularly in the region around the capital Cuzco, where they were part of a system of seq'es radiating out from the Temple of the Sun.

Observation of the Sun was of great importance in Inca culture, particularly in determining the calendar and the agrarian cycles associated with the tropical year. As a consequence, observation of the sky plays a central role in this book. However, the reader need not be an expert in astronomy to grasp its significance. The peoples of the Inca kingdom observed the apparent motions of the Sun, the Moon, and the brightest planets. They were also familiar with certain particularly prominent constellations in the southern hemisphere, including bright star constellations and asterisms, interpreted in the Western manner, and 'dark' constellations with zoomorphic shapes standing out against the bright background of the Milky Way, itself likened to a sacred river.

Progressing through the book, the reader will discover the long and eventful history of Peru's different cultures and the civilizations that have succeeded one another in this often inhospitable land. I hope he will enjoy delving into the fascinating story of the Andean peoples, and the Inca world in particular. Finally, I hope the many photographs will bring to life the profound and ceaseless interaction between the heavens, the world of the gods, and the world of humans.

Note The transcription of Quechua terms is not always obvious and the spelling adopted can vary according to the authors. In this work, words of Spanish origin have been adopted. The names of sites and different cultures are usually written in Spanish. For common names, anthroponyms, and ethnonyms, the Quechua spelling has generally been preferred.

Spellings have been taken from the following two dictionaries:

- Gonzales O., Janney C.M., Thompson E.F., *Quechua–Spanish–English Dictionary*, Hippochrene Trilingual Reference, New York (2018),
- *Diccionario Quechua-Español-Quechua*, Academia Mayor de la Lengua Quechua, Gobierno Regional Cusco, Segunda edición, Cuzco (2005).

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Contents

1

Introduction

From the Pacific Ocean to the Amazon forest, Peru's relief creates three contrasting geographical zones: the *costa*[1] (the coastal plains), the *sierra* (the Andean mountains), and the *selva* (the Amazon forest). A major corollary is the diversification of ecosystems. With such marked geographical transitions, the local populations had to be well adapted to the landscape. The intensive exploitation of harsh natural environments, essential for their survival, has favored a constant exchange of goods and ideas between the different peoples and a shared cultural tradition, despite local variants associated with different places and times. Andean history oscillates between tendencies towards standardization specific to vast 'temporal horizons,' with the dominance of clearly asserted cultures such as those of the Chavín, the Wari, or the Incas, and 'intermediate periods,' where regional specificities are manifested in particular through artistic creation.

The basic structure of Peruvian society over the centuries is the Andean clan or *ayllu*, which depends on mutual assistance in goods and services with the redistribution of available resources by the local chief, the *kuraka*. The *ayllu* regulates the use of land, organizing works of general interest and managing the problems associated with agricultural practices and generated by the production of goods. The Andean clan was the basic social structure of Inca society on which the power of the rulers was built.

The Inca people successfully integrated the cultural contributions of the societies that went before them to develop their domination over a huge territory and build up a highly effective political and social organization. Indeed,

[1] The words defined in Appendix A will be printed in italics in the text.

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it worked so well because it was built on the contributions of previous models that were deeply anchored in the cosmological vision of the local populations. It took the brutal intervention of the Spanish conquistadors, bringing in their wake the inquisitors and the 'extirpators of idolatry,' acting in the name of the Church of Rome, to wipe out this beautiful civilization, which otherwise would probably have survived a great deal longer (Bernand, 2010).

Artistic production shows that Andean art was subject to many forms of political and religious constraints. This can be seen in the powerful functional architecture specific to temples, fortresses, and certain districts of cities, but also in the many and varied ceramics made for everyday or ceremonial use, monochrome or shimmering with color, radiant with the artisan's know-how. Not to mention the production of magnificent and expressive camelid wool textiles, which could be offerings dedicated to the divinities or the conspicuous sign of the high social status of their owners.

If we judge the Incas from what remains of their civilization today, including archaeological sites, written testimonies essentially in the form of Spanish chronicles, and an omnipresent iconography in the form of jewelry and ritual or everyday ceramics, what we find is that these people developed an extraordinary culture without inventing the wheel or writing. By making good use of human energy and intelligently implementing an extremely hierarchical administration, the Incas managed to develop in just a few decades a remarkably united society. Indeed, it was undoubtedly one of the most complex and admirable organizational structures the world has ever known.

Observation of the sky was of considerable importance for the Andean peoples, including the Incas and all the other civilizations that preceded them in this region. These populations observed the apparent motions of the Sun, the Moon, and the brightest planets. They were also familiar with the most prominent constellations in the southern hemisphere, whether constellations of bright stars forming asterisms or 'dark' constellations with zoomorphic shapes appearing in clear contrast to the diffuse glow of the Milky Way. This is attested by the numerous astronomical observations recorded in the writings of Spanish authors, but also in the abundant inscriptions found on steles and other monuments of a religious or secular nature at archaeological sites.

Studies of the arrangement and orientation of monuments in ceremonial centers as well as certain architectural alignments testify to the fact that these result from astronomical considerations, in particular from observation of the Sun (solstices and equinoxes). Their awareness of the heliacal rising and setting of certain stars, such as the Pleiades, suggests that all these peoples, and in particular the Incas, had a keen interest in observing the sky at certain significant times of the astronomical year. These observations and the development of

calendar-related devices were justified by the need to plan agricultural tasks as the seasons went by, but they were also important for religious and ceremonial activities marking the significant moments of the tropical year.

The efforts made to obtain a detailed knowledge of certain astronomical phenomena are easy to understand when we consider the relationship between these phenomena and the environment in which these people lived, not to mention the cultural context. Consider, for instance, the survival problems caused by seasonal climatic changes linked to the *El Niño* phenomenon, a warm seasonal current off the coast of Peru and Ecuador that marks the end of the fishing season, and other climatic phenomena like drought, hurricanes, and storms. Astronomy provided a link between religious ideas and daily or seasonal agricultural practices, so it played an important role in Andean societies, where politics was also permeated by a lively cosmogony.

2

Geographical Contrasts and Climate Diversity of the Andean Regions

2.1 Landscape and Climate Diversity

We generally include in the region called the 'Central Andes' an area delimited by the Pacific Ocean on one side and by the Amazon rainforest on the other. This region includes the far north of Chile, the highlands of Bolivia, and present-day Peru, which encompasses the coastal zone, the central mountains, and the Amazonian piedmont. Its northern limit is located not far from the border between Peru and Ecuador. On the southern borders, we find the high plateaus which extend the region of Lake Titicaca towards the south, where we encounter almost uninhabited areas such as the Atacama Desert.

Except for the southern highlands, the Central Andes is a large but highly fragmented region featuring many narrow coastal valleys with steep slopes, separated from each other by desert areas (Fig. 2.1). The traveler going from the Pacific Ocean towards the Amazon forest will encounter, over a distance of approximately 200 km, a wide variety of different ecosystems, including essentially three types of environment arranged according to a vertical structure. The hot lands extend on both sides of the Andes up to an altitude of around 2000 m, although this varies depending on the location. Higher up, there are mountain valleys with crops present up to around 3500 m. Higher still, and up to around 5000 m, the landscape is made up of the cold areas of the *puna*, which finally give way to rock formations and glaciers with the possible presence of moss and lichens. Some mountain peaks exceed 6000 m in altitude.

The coastal strip, with the Atacama Desert, forms a desert region where it hardly ever rains, except for a light drizzle (*garúa*) in winter. It also has many cliffs covered in cacti. In this region, we sometimes find deep valleys with fertile

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Fig. 2.1 Desert landscape along the road from Lima to Nazca. Author's photograph

and largely irrigated areas as well as oases where cotton, corn, and squash are cultivated (Figs. 2.2 and 2.3). Above 300 m, the temperature is favorable for growing avocados, guavas, chili peppers, lucumas, and coca.

Virgin forest (or *selva*) grows in the eastern foothills of the Andes. It covers the Amazonian lowland and corresponds to relatively sparsely populated areas. The inhabitants currently cultivate peppers, cotton, coca, peanuts, cocoa, cassava, and avocado. There are also precious woods, resins, and pharmacological plants. The *selva* has a humid, tropical climate with up to 200 days of rain per year and temperatures easily reaching 30 °C.

In the mountains (or *sierra*), farmers have developed intensive agriculture by setting up numerous cultivable terraces on the slopes at the temperate level. These areas are favorable for agricultural production of quinoa, amaranth, barley, potatoes, and oca, crops grown up to 4000 m above sea level. Farmers have long used irrigation to compensate for variations in rainfall (Fig. 2.4).

The Andes Mountain Range (*Cordillera de los Andes*) is the north–south oriented mountain range that extends along the western coast of South America. It is approximately 7000 km long and varies between 200 and 800 km wide. The cordillera peaks at 6962 m and its highest point in Peru is the Huascarán, at 6768 m. Many peaks are snow-capped. The Andes are part of the Pacific Ring of Fire, an area of intense volcanic activity (Fig. 2.5).

The *puna* is a grassland region specific to high altitude, stretching south of the Central Andes. It borders the arid and often desert coast of the Pacific. The *puna* is a particularly good area for breeding llamas and alpacas. There

Fig. 2.2 An example of a fertile valley where intensive agriculture is practised near desert areas. This photo was taken along the road from Arequipa to Nazca. Author's photograph

Fig. 2.3 Oasis of Huacachina (province of Ica). Author's photograph

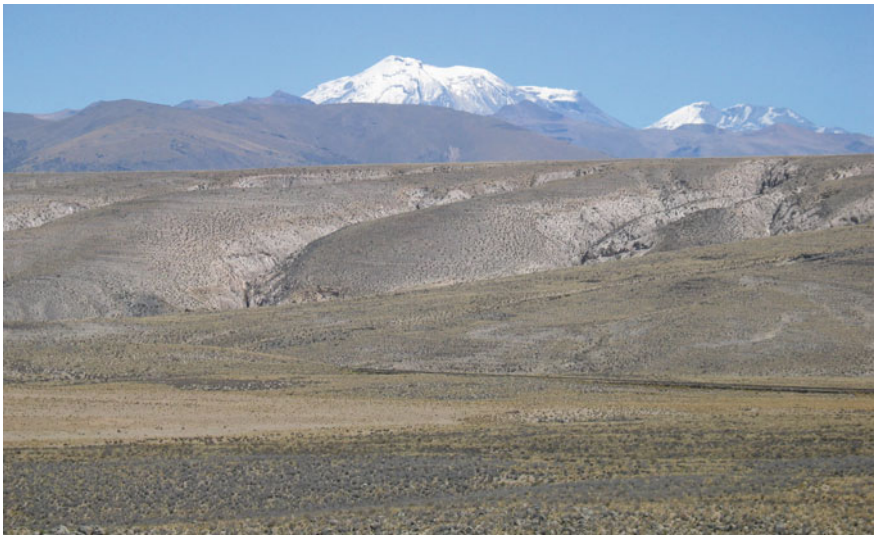

Fig. 2.4 High mountain landscape with deep valleys and snow-covered peaks. Photo taken near Colca Canyon. Author's photograph

is also an abundance of deer, rodents, and camelids such as the vicuña, but also predators like the puma (Fig. 2.6). In places where there is no night frost, quinoa and a wide variety of potatoes are grown, but also more specific crops such as oca, ulluco, mashua, and maca.

In the high plateau of the Central Andes is Lake Titicaca, whose banks are very fertile. In these regions, the flooded field technique was once used for agriculture, a fertilization method which at one time ensured the development of Tiwanaku (Mathé 1996; Cavatrunci et al. 2005).

Peru has two seasons: a dry season and a wet season. In the Amazon plain and on the eastern slopes of the Andes, the heaviest precipitation occurs from January to April, while the dry season extends from May to November. Summer is generally a little cooler than winter. In the mountains, the months of January to April are often hotter and more humid than the months of May to September, which are usually dry and cool. In the desert region, summer occurs from December to March. At this time, the air is hot and humid, but from May to November, a mist that the Peruvians call *garúa* forms along the coast.

The Northern Andes, in the Quito region, have a different appearance from the Central Andes. At high altitudes (above 3500 m), wet meadows are favorable for livestock farming, particularly alpaca and llama, and there is a large population of farmers in the mountain valleys (Rachowiecki & Beech 2006).

Fig. 2.5 The Peruvian Andes cordillera seen from an airplane. Author's photograph

2.2 An Extreme Climate Episode: *El Niño*

The climate in the coastal regions of Peru is influenced by sea currents. Normally, the coasts of Chile, Peru, and Ecuador are bathed in the cold current known as the Humboldt, which heads towards the north, and they are swept by winds which blow from the south-east towards the north-west. These winds chase away warm water from the ocean surface, which generates an upwelling of colder water from a depth of between 100 and 200 m. These waters are rich in nutrients and cause the development of plankton, which attracts birds and fish, a favorable context for the development of fishing activities.

Every year, around Christmas and until April, a coastal current from the open sea is set in motion towards the south. This is a warm current called *El Niño* ('little boy,' in Spanish), which appears off the coast of Peru and Ecuador

Fig. 2.6 The *puna* is the ideal area for breeding llamas and alpacas. Author's photograph

and which is characterized by abnormally high temperatures (Changnon & Bell 2000). Its appearance moves the areas of precipitation eastward into the Pacific Ocean, and prevents the upwelling of cold water along the coast of South America. This results in a depletion of nutrients in the water, with a reduction in wildlife and significant collateral damage for the fishing industry. At the same time, the coastal regions of northern Peru and Ecuador, which usually receive little rain, experience extremely heavy rainfall.

The name *El Niño* refers to the Child Jesus and is attributed by South American fishermen because it occurs shortly after Christmas. Originally, this term referred to an annual climate episode before being adopted for 'extreme' situations with a very warm current which manifests itself further south up to the coast of Chile. Very marked events of this type, with temperature anomalies of up to 4 or 5 °C, took place in particular in 1982–83, 1997–98, and 2014–16. *El Niño* generally lasts about eighteen months (Glantz 1996; Caviedes 2002).

La Niña (the 'little girl,' in Spanish) refers to an opposite phenomenon to *El Niño*, but constitutes an important episode of climate variability. *La Niña* episodes occur every 4 to 5 years, generally last 1 to 2 years, and do not appear to be directly correlated with *El Niño*. This climate disturbance, which finds its origin in a thermal anomaly in the equatorial surface waters of the central Pacific Ocean, is characterized by an abnormally low temperature of these waters.

3

Sources Relating to Peruvian Civilizations

3.1 Famous Travelers, Explorers, and Archaeologists

Important information about the Andean peoples comes from travelers who criss-crossed South America at different times and who have supplied us with first-rate documentation relating to the customs and traditions of the original inhabitants of these regions.

There are a great many ancient sites in Peru. Archaeological discoveries continued in this country throughout the twentieth century, revealing numerous traces of the first civilizations, and a number of museums have been built to house the finds. On the basis of the ruins that have been unearthed, different theories have been proposed or explored further, and this has contributed to a better knowledge of the history of the country and the various civilizations that developed on its territory. These contributions are the work, on the one hand, of foreign scientists who came to carry out excavations in Peru, but also of Peruvian archaeologists, stimulated by the numerous discoveries in their own country, sometimes spectacular and widely publicized.

In a sense, we may say that modern archaeology began in Peru when the German geologist and explorer William Reiss (1838–1908), along with his compatriot, the geologist and volcanologist Alphons Stübel (1835–1904), stumbled across a huge necropolis on the coast bordering Ancón Bay. These ruins were discovered in 1875 during the construction of the Lima–Chancay railway. In fact, in 1868, Reiss embarked with Stübel on a trip to Hawaï but both stopped in Colombia, fascinated by the Andes. They then carried out a series of geological, ethnographic, and archaeological studies in Colombia, Ecuador, and

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Peru. Back in Germany, the two scientists published in Berlin (Reiss & Stübel 1880–1887) *Das Totenfeld von Ancón in Peru*, a monumental text which was translated into English under the title *The Necropolis of Ancón in Peru*. Stübel went on to carry out further research on the Tiwanaku site in Bolivia.

Friedrich Maximilian Uhle, abbreviated Max Uhle (1859–1944), was a German archaeologist who is considered the father of Peruvian archaeology. From 1888, as an assistant at the Berlin Museum, he became interested in South American archaeological collections. From 1892, he studied certain archaeological sites in Bolivia and Peru and became interested in the collapse of the Inca empire. With funding from several American universities, he visited different places and took part in excavations at various sites such as Tiwanaku, Pachakamaq near Lima, Chancay, and Supe. He was also interested in Chimús and Moche ruins in the north of the country and made many original contributions on the archaeological and ethnological levels.

From 1905, he visited a site near Caral, and subsequently carried out further excavations in Chile and Ecuador, before returning to Germany in 1933. In 1935, he published a synthesis of his contributions under the title *Die alten Kultur von Peru*, a work devoted to pre-Inca civilizations. A Spanish version of this text was published in 1956 (Uhle 1956). He was the first to distinguish the Mochicas and the Chimús on the cultural level, and in 1913, wrote a text entitled *Die Ruinen von Moche* (Uhle 1913). Stübel also worked with Max Uhle at Tiwanaku and published with him an important work related to this site: *Die Ruinenstätte von Tiahuanaco im Hochlande des alten Peru* (Uhle & Stübel 1892). There is a work on Max Uhle and his contributions to Peruvian archaeology by J. H. Rowe (Rowe 1954).

John Howland Rowe (1918–2004) was an American archaeologist and anthropologist. His notoriety comes mainly from the studies he published relating to the Inca civilization. After studying at Brown University and Harvard University, he undertook excavations notably in southern Peru, then in Wari and Cuzco, under the auspices of the Peabody Museum of Archaeology and Ethnology of Harvard University. He developed departments of archaeology and anthropology in the universities where he stayed (Cuzco, Popayan in Colombia) then he taught at the University of California at Berkeley until the end of his professional life in 1988. His work on our understanding of Inca culture at the time of the Spanish conquest (Rowe 1946, 1957) constitutes a major contribution to this field.

Rowe proposed a chronology of pre-Hispanic Peru which still remains a reference for Peruvian archaeology today. The 'periodization' of the pre-Columbian era that we owe to him is based on changes in the style of ceramics and remains a major reference. To classify the different archaeological phases,

he refers to 'cultural horizons' and 'intermediate periods.' The horizons designated periods during which a dominant culture developed and exerted its influence over the entire country while the intermediate periods were phases during which the regions regained a certain autonomy and their social and religious particularities. Established in 1958, this classification could not, however, take into account subsequent discoveries such as those made at the site of the Kotosh temple or on 'pre-ceramic' sites dating back more than 1000 years BCE.

Adolph Francis Alphonse Bandelier (1814–1940), an American archaeologist and anthropologist of Swiss origin, was a great specialist in pre-Columbian civilizations. He was particularly interested in Ecuador, Peru, and Bolivia, and collaborated with the Museum of Natural History in New York. In 1911, he was commissioned by the Carnegie Institute in Washington to study, particularly in Spain, the archives relating to Indian populations. Between 1892 and 1903, he carried out numerous excavation campaigns in the Peruvian altiplano and in Bolivia, particularly in the region of Lake Titicaca, and in 1919, he published the work entitled *The Islands of Titicaca and Koati* (Bandelier 1910). He studied in detail the citadel of Kuelap, the capital of the Chachapoya people. Built around the nineteenth century, this fortress was the largest construction built by these people. It is a spectacular structure covering an area of more than 7 ha and is protected by a precipice and narrow entrance corridors. The studies made by Bandelier, who is among the pioneers of pre-Columbian archaeology, are based not only on excavations but also on archival investigations, and give pride of place to ethnological and anthropological methods.

Hiram Bingham (1875–1956) was an American explorer and politician. Born in Honolulu, he graduated from Yale in 1898, the University of California in 1900, and Harvard in 1905. He taught history and politics at Harvard and then at Princeton. In 1909, he went to Peru and learned about Inca culture. It was in 1911 that he discovered the site of Machu Picchu while searching for the ruins of Vilcabamba, the last refuge of the Incas after the Spanish conquest. He discovered the main access routes to the site, uncovered numerous tombs, and exhumed a large number of objects of archaeological interest. His discovery, published by *National Geographic* magazine in 1913, was a resounding success. In 1948, he published *Lost City of the Incas, the Story of Machu Picchu and Its Builders* (Bingham 1948), which is still one of the major works on the Machu Picchu site. This text is also available in French (Bingham 1989, 2008).

It seems likely that H. Bingham only re-discovered the Machu Picchu site. According to a Peruvian Benedictine historian and explorer of the Cuzco region, Paolo Greer, the primacy of discovery should go to the German Augusto Berns, a mining prospector who worked in the Cuzco region in 1860–1870