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Angaben zur Veröffentlichung / Publication details:

Lambers, Karsten. 2020. "Walking and marking the desert: geoglyphs in arid South America." In *A human environment: studies in honour of 20 years Analecta editorship by prof. dr. Corrie Bakels*, edited by Victor Klinkenberg, Roos van Oosten, and Carol van Driel-Murray, 89–105. Leiden: Sidestone Press.
<https://www.sidestone.com/books/a-human-environment>.

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Walking and marking the desert: Geoglyphs in arid South America

Karsten Lambers

The narrow desert wedged between the Pacific Ocean and the Andes in South America is one of the most arid and inhospitable regions in the world. Yet it is also a striking example of human interaction with extreme environments. Geoglyphs – man-made markings of the ground surface in naturalistic or geometric shapes – cover portions of the desert in Chile and Peru at large scale, showing how the arid environment was used and shaped according to socio-cultural ideas and needs. Dating mostly from pre-historic times, the geoglyphs are preserved due to extreme environmental conditions and can still be appreciated today.

This paper reviews archaeological evidence of geoglyphs in arid South America in order to shed light on their function and meaning. The two largest geoglyph concentrations, in the Nasca basin in south-central Peru and in the Atacama desert in northern Chile, serve as examples to discuss shared traits and differences between various geoglyph traditions. In spite of formal, functional, and chronological differences between geoglyphs of the two regions, there is evidence of a common conceptual framework in which ancient Andean societies interacted with the arid environment in diverse and complex ways.

Keywords: Geoglyphs; South America; Arid Environment; Landscape Archaeology

1. INTRODUCTION

Geoglyphs are a distinctive element of the South American archaeological record. They are found in a variety of locations along the Pacific coast of the Americas, from California to Chile (Clarkson 1999; Rodríguez 1999; Valenzuela and Clarkson 2018). The term “geoglyphs” (Greek for “ground carvings”) refers to man-made drawings of different size, shape and motif on the ground surface. They are most easily made, and best preserved, in a stable, arid environment where the ground surface may be easily altered manually yet is little affected by rain or wind erosion. In South America, such favorable conditions prevail in the coastal desert along the western foot of the Andes, where the ground surface is composed of a dark layer of oxidized stones covering a finer and lighter sediment beneath. The largest and best-known concentrations of geoglyphs are located in two such regions, the Nasca basin in south-central Peru and the Atacama desert in northern Chile (figure 1). While the geoglyphs in both regions exhibit a wide variety of shapes, proportions, and iconographic motifs, lines and trapezoids predominate in the Nasca region, whereas biomorphic and geometric figures are more common in northern Chile. The pre-historic earthworks in the Amazonian basin east of the Andes that were also called ‘geoglyphs’ in recent research (e.g., Pärssinen *et al.* 2009; Watling *et al.* 2017) do not conform to the definition used here and are thus not treated in this overview.

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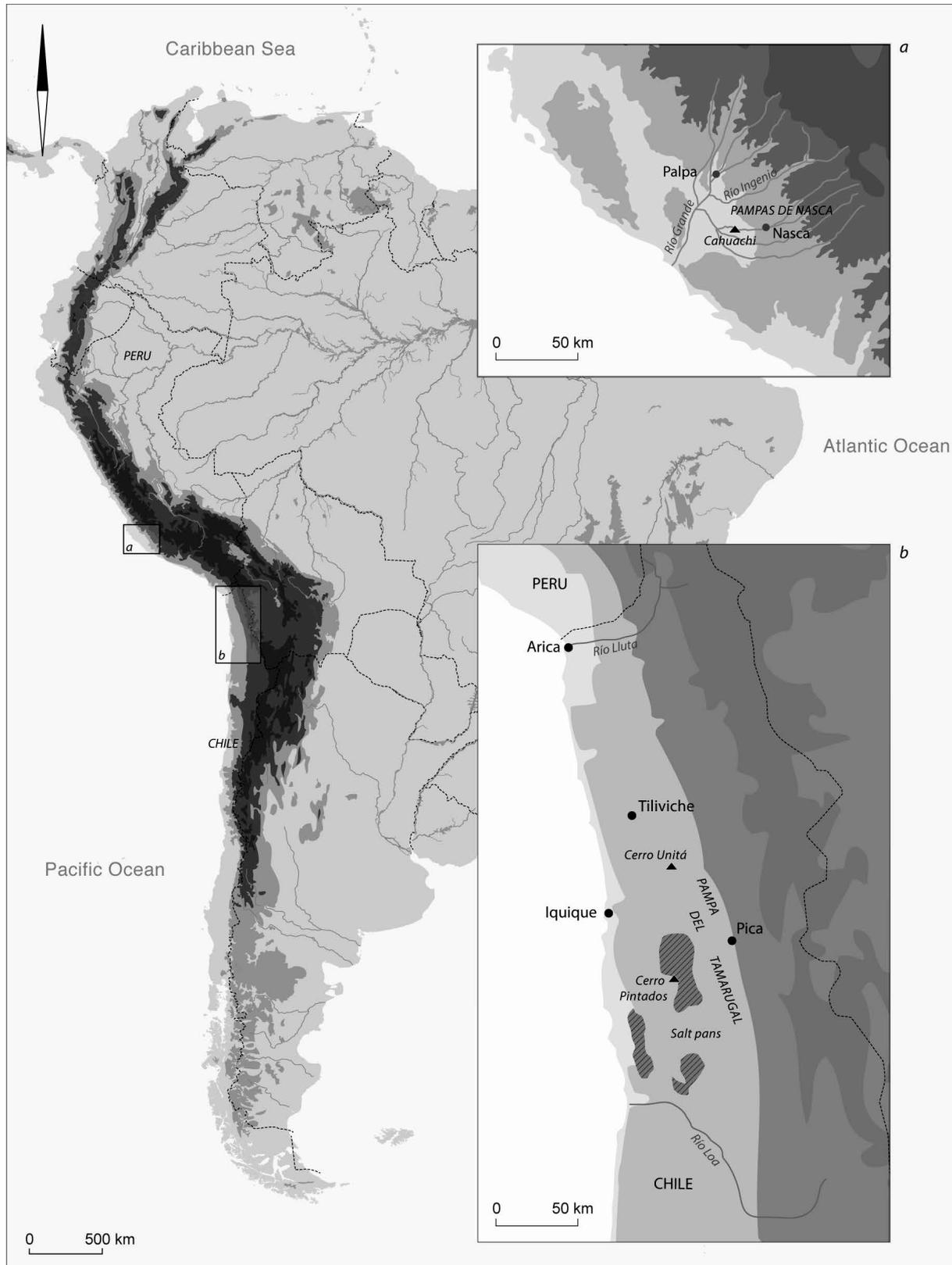
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Geoglyphs in the Nasca basin, the Atacama and other regions (*e.g.*, Bikoulis *et al.* 2018; Stanish and Tantaleán 2018) have long posed considerable challenges to archaeologists. As shallow surface features in often inaccessible terrain they are not easy to detect, let alone to map. Aerial images have been successfully used for this purpose at some sites (Aveni 1990; Rodríguez 1999; Lambers 2006). More recently, high-resolution optical and radar images taken from airborne and spaceborne platforms have been used as base data for regional mapping (Hanzalová and Pavelka 2013; Tapete *et al.* 2013; Masini *et al.* 2016; Chapman *et al.* 2016; Sakai and Olano 2017; Pavelka *et al.* 2018). In spite of these efforts, many geoglyph sites have not been adequately recorded until today, and few detailed, reliable maps are available.

Geoglyph dating is another issue (Clarkson 1996). In spite of promising initial results, attempts of chronometric dating that rely on rocks either exposed during geoglyph construction (Clarkson and Dorn 1991; Rink and Bartoll 2005) or covered in the process (Greilich and Wagner 2009) have so far largely failed to provide archaeologists with sufficiently reliable and fine-grained direct dating. Therefore, iconographic comparison and cross-dating of associated ceramics remain the most important vehicles of geoglyph dating. The difficulties involved in geoglyph documentation and dating have often hampered the understanding of the socio-cultural context in which the geoglyphs were conceived, built and used, which in turn affected the interpretation of their function and meaning.

In spite of these challenges, since the 1980s geoglyph studies in both Peru and Chile, building on archaeological, anthropological and scientific evidence, have opened up new avenues for geoglyph interpretation. The geoglyphs in both the Nasca basin and the Atacama desert are now understood in the context of the Andean worldview. According to these studies the Nasca geoglyphs fulfilled a crucial role for social organization and cohesion, while the Atacama geoglyphs had an important socio-economic dimension.

In what follows the southern Peruvian geoglyphs and the northern Chilean geoglyphs serve as examples to discuss the environmental, archaeological, and

socio-cultural contexts of South American geoglyphs as a basis for their interpretation.

2. MAJOR SOUTH AMERICAN GEOGLYPH COMPLEXES

2.1 Nasca basin, south-central Peru

2.1.1 Environmental, chronological and archaeological context

Probably the best-known geoglyph complex in South America (and beyond) is located on the *pampas* of Nasca, a vast desert plain of approx. 250 km² bordered by the Andean foothills to the east, the Ingenio river to the north, and the Nasca river to the southwest (figure 1a). Prominent animal figures such as the monkey, the spider, the pelican, the whale, the hummingbird and others are located in this area, mainly along its northern and southern margins (Aveni 2000; Eda *et al.* 2019). Much of the plain's interior is transected by long, straight lines that often converge in so-called line centers located on elevated terrain (figure 2; Aveni 1990, 2000; Reiche 1993; Ruggles and Saunders 2012; Sakai *et al.* 2014). It is these lines that are the most common geoglyph type and predominate at many geoglyph sites. Other geometric geoglyphs include large trapezoidal or rectangular cleared fields (Hawkins 1974; Orefici 2009).

Smaller but similar geoglyph sites are found along all the Grande river tributaries, *e.g.* to the south of the monumental site of Cahuachi on the Nasca river, along the Ingenio river and around the Palpa alluvial plain in the northern part of the drainage (Silverman 1990, 1993; Silverman and Browne 1991; Lambers 2006; Masini *et al.* 2016). The Nasca basin, wedged between the coastal cordillera to the southwest and the Andean foothills to the northeast, thus consists of narrow but fertile river oases that sustained the ancient population, and in-between and above them vast stretches of desert that served as ideal drawing grounds for geoglyphs. As recent geomorphological and palaeoclimatic studies have shown (Eitel *et al.* 2005; Hesse 2008; Eitel and Mächtle 2009; Mächtle *et al.* 2010; Mächtle and Eitel 2013), this setting largely prevailed since the time of the Early Horizon (800 to 200 BC) and thus provided the arid environmental framework for the Nasca geoglyph phenomenon.

The geoglyphs in the Nasca region were conceived, built and used by the Paracas (800 to 200 BC – Early Horizon) and Nasca (200 BC to AD 650 – Early Intermediate Period) societies (Silverman and Proulx

Figure 1 (previous page): South America with the Nasca basin in south-central Peru (a) and the Atacama desert in northern Chile (b). Both arid regions are situated between the Pacific Ocean in the west and the Andes mountain range in the east. Map: J. Porck and K. Lambers.



Figure 2: Linear geoglyphs of various widths converging on slightly elevated terrain on Cerro Carapo, to the east of Palpa in the Nasca basin, looking south. Photo: K. Lambers.

2002; Reindel 2009; Conlee 2016; Isla 2017). Their economy was based on the agricultural use of the fertile soils of the river valleys. Due to a slow but constant process of aridification and the up-valley shift of the eastern desert margin (Eitel *et al.* 2005; Eitel and Mächtle 2009; Mächtle and Eitel 2013; Soßna 2015) the use of seasonal rivers and perennial aquifers as water sources for field irrigation became ever more sophisticated over time (Schreiber and Lancho 2006). Ultimately, however, at some point during the Early Intermediate Period to Middle Horizon transition around AD 700 it failed to provide a sufficient basis to sustain the formerly dense population. Water and its source, mountains, apparently played important roles in the Nasca worldview (Reinhard 1996), as did a variety of mythical beings depicted on ceramics, textiles, and in some instances in petroglyphs and geoglyphs (Silverman and Proulx 2002; Clados 2006; Proulx 2006; Carmichael 2016). The highest level of political complexity in the Nasca region was reached

in Early Nasca times (AD 1 to 250), when the whole basin shared common cultural traits, and the monumental site of Cahuachi on the Nasca river served as a center of ritual activity, if not political power (Silverman 1993; Vaughn 2009; Conlee 2016; Orefici 2016b). Towards the end of the Nasca period, along with increasing aridification, the political landscape became more fragmented, regional centers arose, and a strong external influence became apparent in Nasca iconography (Proulx 2006). While some parts of the Nasca region saw a considerable demographic decline at the beginning of the Middle Horizon (from AD 700 – Reindel 2009; Soßna 2015), other parts were clearly integrated into the sphere of the highlands-based Wari society (Schreiber 1999, 2000; Isla 2001; Conlee 2016). Although the Early Intermediate Period to Middle Horizon transition (ca AD 700) in the Nasca basin and its socio-political, cultural, and environmental parameters are still poorly understood, it seems clear that it brought about the end of the Nasca geoglyph tradition. The construction of new geoglyphs ceased completely, although geoglyph use may have continued for some time in the southern part of the basin (Sakai *et al.* 2014; Sakai and Olano 2017).

2.1.2 The geoglyphs

During the Paracas and Nasca periods, the vast desert portions of the Nasca basin were incorporated into the social and cultural domain of the valley-based society like never before or after. The inhabitants of the valleys frequently gathered in the desert for geoglyph construction and use, marking the landscape at large scale according to their needs. While the apparent maze of geoglyphs seen today is the result of more than a thousand years of intensive desert use, stratigraphic evidence reveals that biomorphic figures located on hillsides are among the oldest geoglyphs (Lambers 2006, 2012, 2017). Many of them have suffered erosion or destruction by human activity already since Nasca times. Early geoglyphs include birds, felines, and anthropomorphic figures, often in groups (figure 3). Among the human figures are full-body depictions, some of them with headdresses, staffs held in hands, or even trophy heads tied to their belts, but also head-only depictions and figures featuring human and non-human traits, *e.g.* snakes emerging from body parts. Like later geoglyphs, the early figures were made by removing dark stones from lighter sediments. But unlike later geoglyphs, the removed stones were not just used to mark the outlines of the figures, but were also piled up in the

Figure 3: Paracas-style anthropomorphic geoglyphs on a slope near Llipata in the Nasca basin, looking north. The geoglyphs were restored in the early 2000s. Photo: Nasca-Palpa Archaeological Project, used with permission.



interior of the figures to form eyes, mouths, and other anatomical features. Their position on sloped terrain allowed these early geoglyphs to be seen from a distance. Hardly a trace of use is usually associated with these figures, in marked contrast to later geometric geoglyphs on which traces of varied human activity abound.

The motifs, style, and topographic setting of these early geoglyphs closely resembles petroglyphs, of which many are found in the Nasca basin (Nieves 2007; Fux *et al.* 2009; Fux 2012; Orefici 2016a), most of them dating to the Paracas period (800 to 200 BC – Early Horizon). The geoglyph phenomenon thus seems to have evolved out of the older petroglyph tradition by transferring common motifs from rock surfaces to the nearby ground surface.

Another strand of tradition may have contributed to this development. At certain places on the desert plateaus in the Palpa region Paracas ceramic vessels were deposited on the desert surface in remote locations over extended periods of time, an activity originally not accompanied by any kind of surface markings or structures (Lambers 2012, 2017). While the context of this activity is unknown, at some point during the Paracas-Nasca transition it seems to have been combined with desert surface marking. At that point the main purpose of geoglyphs became walking upon them, and placing ceramic vessels on, along or around them, as evidenced by heavily compacted line surfaces and numerous surface finds (Gorka *et al.* 2007). Judging from these associated finds, straight lines on hillsides and flat plateaus are among the oldest geometric geoglyphs, dating to the Late Paracas (400 to 200 BC) or Initial Nasca period (200 to 1 BC).

By Early Nasca times (AD 1 to 250), a wide variety of new shapes, proportions and motifs of geoglyphs had developed, among them different types of lines (straight, zigzag, meandering, spiral), trapezoids and rectangles, and diverse zoomorphic figures (Lambers 2006; Sakai and Olano 2017). Most of these new geoglyphs were now located on flat terrain on the desert plateaus above the valley, on which many new geoglyph sites had been opened up (figures 4, 5). New geoglyphs often crossed or covered older geoglyphs, and existing geoglyphs were frequently enlarged or altered, indicating the importance of geoglyph construction as a social activity in its own right (as opposed to geoglyph use). Many unfinished geoglyphs, noticeable through stone heaps awaiting removal on partially cleared surfaces, provide additional evidence for the frequent construction and remodeling activity on geoglyph sites (figure 6). Stone platforms on hills or along plateau edges overlooking the valleys communicated geoglyphs on plateaus with lines fanning out over the hillsides. On trapezoids, stone platforms near the wide and the narrow ends, sometimes accompanied by wooden posts, served as places for gatherings and offerings (figure 4; Reindel *et al.* 2006).

In terms of variety and quality, Early Nasca was clearly the apogee of the Nasca geoglyph tradition. During Middle and Late Nasca times (AD 250 to 650), new geoglyphs and stone platforms were still built, among them some of the largest of which we know (figure 5), and activities on geoglyph sites still flourished. However, the formal repertoire was gradually reduced to a limited set of geometric lines and trapezoids, some sites were abandoned, and no new sites were added. The end of the geoglyph tradition is

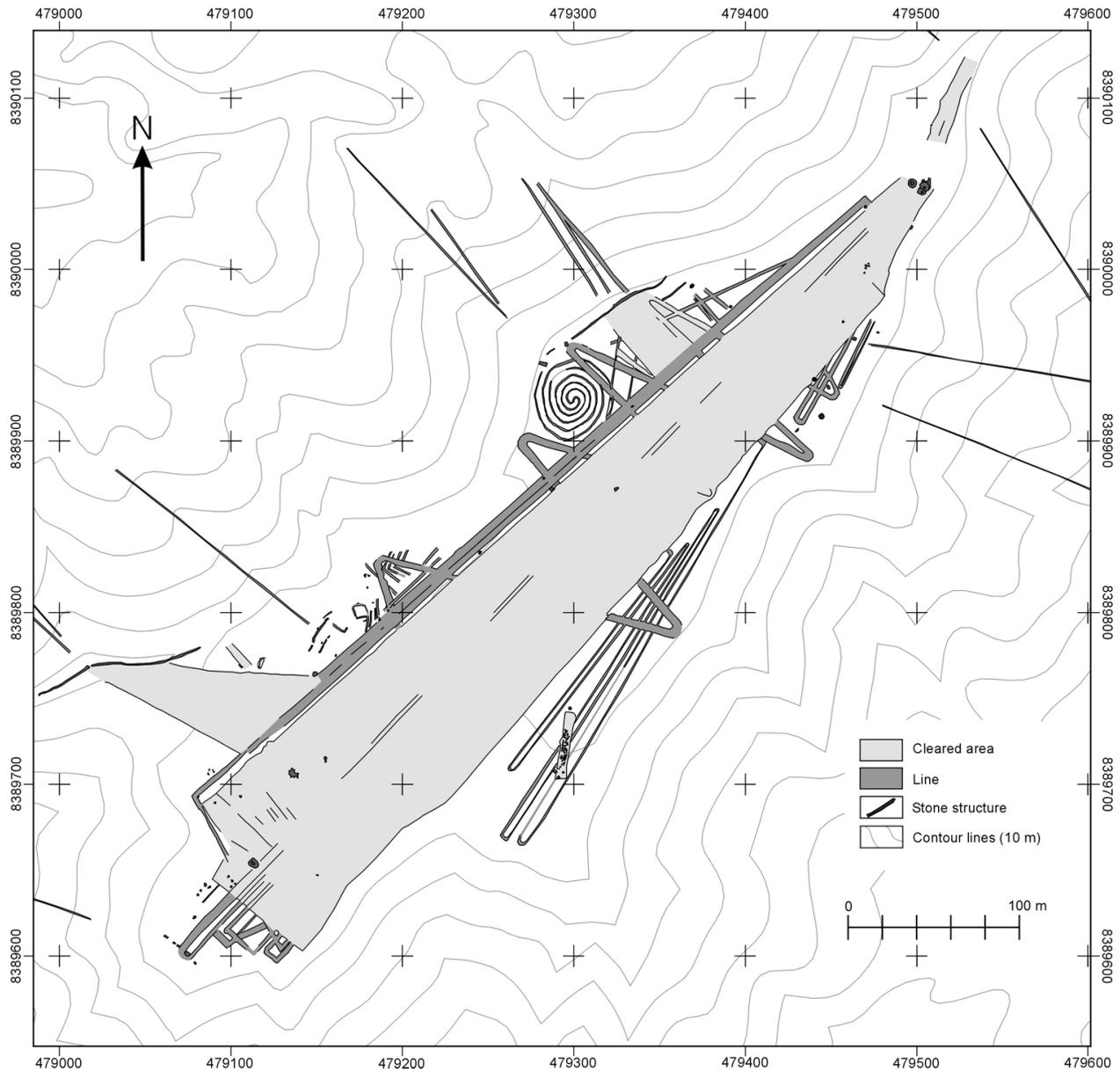


Figure 4: Typical combination of geometric geoglyphs on a plateau above Llipata in the Nasca basin. A central trapezoid, enlarged at least on one occasion, is flanked by parallel lines and crossed by a zig-zag line. Smaller lines, trapezoids and a spiral accompany these geoglyphs. Stone platforms are located on both ends of the central trapezoid. Coordinates: WGS84, UTM 18S. Map: K. Lambers.

marked by some ceramic vessels dating to the early Middle Horizon that were still placed along lines and trapezoids in the old fashion (Lambers 2006).

During the Late Intermediate Period (1000 to 1450 AD), when parts of the northern Nasca basin were resettled from the east during a short period of humidification of the local climate (Sořna 2015), some settlements were built on top of large geoglyph

complexes, indicating that by then the geoglyphs were no longer valued nor understood. In the southern Nasca basin, which probably saw a more continuous occupation, associated finds seem to indicate a continued use of linear geoglyphs (Sakai *et al.* 2014; Sakai and Olano 2017), although the main context may now have been traffic across the *pampas* along the lines.

Figure 5: Complex geoglyph site on the Pampa de San Ignacio to the south of Palpa in the Nasca basin, looking east. This site is one of the largest and densest concentrations of geoglyphs in the Nasca basin, and at 1.9 km length, the central trapezoid is the largest known geometric geoglyph. Photo: Nasca-Palpa Archaeological Project, used with permission.



Figure 6: Unfinished geoglyph on the Pampa de San Ignacio to the south of Palpa in the Nasca basin, looking south. Unremoved small heaps of stones on a partly cleared surface are visible in the foreground. The border of the geoglyph is visible as a sharp line in the middle ground between the undisturbed desert surface and the partly cleared area. Other portions of this large trapezoid were completely cleared. Photo: K. Lambers.



2.1.3 Social, cultural and historical context

Concerning the socio-cultural context of the Nasca geoglyph tradition, the earliest geoglyphs were clearly part of the Paracas symbolic and artistic repertoire. Originally Paracas geoglyphs were but one among several artistic expressions that were very similar in terms of style and motifs, *e.g.* decorations on textiles and ceramics or petroglyphs (Paul 1991).

The subsequent developments into a prominent independent phenomenon during the Initial and Early Nasca period (200 BC to AD 250) coincided with other important transitional processes, such as technological innovation, population growth, increasing social complexity, the rise of Cahuachi as the socio-cultural capital of the region, the development of new art styles etc. during the early Early

Intermediate Period (Carmichael 2016; Conlee 2016). In these dynamic times, geoglyphs emerged as a key element of “Nascaeness” (Silverman 2002). Since monumental architecture was largely absent, communal labor went into geoglyph construction and use. The importance of geoglyph visibility stresses the public character of the gatherings and ceremonies held there (Lambers and Sauerbier 2007, 2009; Vaughn *et al.* 2016). These activities thus might have played an important role in the constitution of social groups and the negotiation of their position within the society, or the role of individuals within these groups (Lambers 2006, 2012, 2017). Though difficult to judge for a lack of reliable maps, the geoglyphs in the Nasca basin seem to show little regional variation (just like Nasca ceramics), meaning that the cultural concepts behind this tradition were shared among the inhabitants of the whole basin.

The importance of the geoglyphs for social cohesion became evident in Middle and Late Nasca times (AD 250 to 650). In spite of the fragmentation of the political landscape, the geoglyph tradition remained a unifying basin-wide element of Nasca culture, its importance being underlined by the fact that activities on geoglyph sites went on even when nearby settlements were abandoned. The geoglyphs thus literally constituted a “common ground” (as aptly termed so by P. Clarkson in the English pre-print of

her 1999 article published in German) for the Nasca society during most of its history.

2.2 Atacama desert, northern Chile

2.2.1 Environmental, chronological and archaeological context

The Atacama geoglyphs are distributed over a larger area than the Nasca geoglyphs, but in lesser density. Their iconography is much more diverse, allowing us to distinguish a variety of local styles. While geoglyphs in the Nasca region were never far removed from settlements, many Atacama geoglyphs are located in uninhabitable stretches of desert. However, they were often associated with ephemeral camp sites pertaining to caravans crossing the desert between the Pacific coast and the Andean highlands, two more densely populated regions with access to different resources. The northern Chilean geoglyphs are found between the Lluta valley in the north and the Loa valley in the south (figure 1b), with minor sites beyond these limits. The central and southern portion of this region is the Tamarugal *pampa*, a vast and hyperarid stretch of desert between the coastal cordillera to the west and the Andean foothills to the east. Within this region, most of the geoglyphs are located either along the dry valleys or the few rivers crossing the *pampa*, or on isolated hills in the midst of the desert, the most



Figure 7: Anthropomorphic geoglyph on the slopes of Cerro Unitá, looking north-east. The figure measures ca 90 m from head to toe and is accompanied by other geoglyphs. It is the biggest human figure known to have been produced in prehistory. Photo: P. Bahn, used with permission.

famous of which is Cerro Unitá featuring the largest known anthropomorphic geoglyph (figure 7).

In the southern portion of the Tamarugal *pampa* there are several large salt pans. To the east, the western cordillera of the Andes reaches elevations of around 6000 m.a.s.l. While the Atacama is quite active in tectonic terms, its arid climate has remained rather stable for a long time, with variations through time mainly affecting the sparsely populated river oases. The general scarcity of water below 3500 m.a.s.l. – *i.e.*, in the area with geoglyphs – seems to have been a persistent environmental feature over the last 5000 years (Grosjean and Núñez 1994; Seyfried *et al.* 1998; Santoro *et al.* 2017), thus creating the desertic conditions that were a prerequisite for geoglyph making and use.

Due to such inhospitable conditions, human population was always sparse and restricted to sites along the desert margins (Rivera 2008). However, the interior of the desert is not devoid of archaeological relics. A dense network of ancient paths crossing the Tamarugal *pampa* is accompanied by remains of ephemeral camp sites such as makeshift shelters, fire places, simple corrals, and occasional burials (Núñez 1976; Briones *et al.* 2005; Pimentel *et al.* 2017). This inter-nodal network of mobility and exchange has been the focus of much recent research (*e.g.*, Nuñez and Nielsen 2011; Berenguer and Pimentel 2017; Nielsen *et al.* 2019). While most of the scarce finds associated with these

camp sites date to the period of Regional Developments (AD 900 to 1450; Berenguer 2004; Valenzuela *et al.* 2011; Nielsen *et al.* 2019), there is evidence of extensive interchange with the highlands since at least Tiwanaku times (AD 300 to 1100; Rivera 2008), and radiocarbon dating of organic materials from some camp sites even resulted in much earlier dates (Briones *et al.* 2005; Nielsen 2013; Pimentel *et al.* 2017). The paths and camps are generally understood as vestiges of llama caravans regularly crossing the desert over many centuries. This interpretation is supported by materials associated with the camps, such as ceramics, stone tools, fish bones, sea shells, minerals, semiprecious stones, and metals, most of which originate outside the desert. The Pacific seashore to the west and the Andean highlands to the east seem to have constituted the end points of trade routes crossing the Tamarugal *pampa* (Ross *et al.* 2008).

2.2.2 The geoglyphs

The Atacama geoglyphs are frequently found along the mentioned paths (figure 8), and often close to camps. Most geoglyphs occupy sloped terrain such as hillsides or valley slopes, a position that renders them easily visible from the surrounding terrain (Valenzuela *et al.* 2011; Nuñez and Briones 2017). Some geoglyphs occur in isolation, but most of them are grouped in complexes that may contain up to 80



Figure 8: Anthropomorphic geoglyphs in the Lluta style and other biomorphic geoglyphs above a trail in the Lluta valley. Photo: D. Valenzuela, originally published by Ross *et al.* (2008: fig. 7), used with permission.

drawings (Briones 2006). While the basic method of geoglyph marking was the same as in Nasca – namely, the removal of dark stones from a lighter sandy layer beneath, and their re-deposition in another place – a more varied application of this method and a wide variety of motifs resulted in a much greater formal diversity of geoglyphs.

Some of the more naturalistic anthropomorphic figures feature headdresses, garments, and objects held in hands. Others are engaged in different kinds of activity, *e.g.* dancing or jumping, or are shown together

with llamas (figures 8, 10). Some anthropomorphic figures are depicted in heavily reduced, abstract fashions that show some regional variation, allowing the identification of different iconographic styles such as Lluta and Pintados (figures 8, 9; Briones 2006). This has led some researchers to suggest that even purely geometric motifs such as the common stepped rhombus pattern may be understood as stylized human figures as well (Briones *et al.* 2005). Other geometric forms include circles, crosses, triangles, stepped patterns, and arrows. Among the zoomor-



Figure 9: Anthropomorphic figures in the Pintados style on the slopes of Cerro Pintados, near Pica. Photo: P. Bahn, used with permission.



Figure 10: Geoglyph panel showing a llama herd and herders near Tiliviche. Photo: P. Bahn, used with permission.

phic figures, groups of llamas are the most common motif, ranging from single llamas to pairs of llamas facing each other to whole herds of llamas (figure 10), sometimes depicted in single file as in a caravan. Other motifs include animals living in the desert (lizards, foxes, serpents), in the sea (dolphins, sharks), along the whole caravan route (dogs, birds) or even somewhere around the far end of the routes beyond the mountains (monkeys). These motifs, most of which also appear in petroglyphs (*e.g.*, Valenzuela *et al.* 2019) clearly demonstrate the far-flung connections of the people travelling along these routes.

Contrary to the Nasca geoglyphs, superimpositions are rare among the Atacama geoglyphs, such that no clear sequence of motifs can be deduced from stratigraphic evidence. Compared to the Nasca geoglyphs, the Atacama geoglyphs occur less often on flat terrain, are usually much smaller, and encompass much less lines and cleared areas. This strengthens the notion that the Atacama geoglyphs were mainly meant to be seen from a distance, not to be walked upon.

2.2.3 Social, cultural, and historical context

The close association of paths, camp sites, and geoglyphs (as well as petroglyphs) clearly indicates that geoglyphs were made and seen by people crossing the Tamarugal *pampa* in caravans. Trade relations between the coast, the valleys and the highlands seem to have existed at least since Tiwanaku times, if not much earlier (see above). They allowed an exchange of

goods like marine resources, minerals, and agricultural products between different ecological zones, some of which were depicted in geoglyphs and petroglyphs (Ross *et al.* 2008; Valenzuela *et al.* 2015). This trade simultaneously enabled a constant flow of people and ideas along the path network (Nuñez and Nielsen 2011; Nielsen *et al.* 2019). Consequently, the iconography of the Atacama geoglyphs shows clear Andean traits, and certain geoglyph styles and motifs are also present in other spatial and temporal contexts as well as in other media (ceramics, textiles).

Generally, the Atacama geoglyphs seem to have served as landmarks indicating the course of the trade route. Some geoglyphs may have marked places of resting stations, water sources, exchange, rituals etc. (Nuñez and Briones 2017; Valenzuela *et al.* 2019). But, this is unlikely to have been their sole function, as paths through the desert are easily visible, and knowledge about trade routes was probably deeply rooted among the people involved in caravan traffic. Furthermore, the great variety of motifs (figure 11) indicates additional meanings and functions.

There has been some debate whether in prehistoric times caravan traffic was part of a transhumance economy in which a single society controlled economic resources in different ecological niches along such routes, or rather a means of inter-societal trade relations (Nuñez and Dillehay 1995; Berenguer 2004; Nielsen 2013; Nielsen *et al.* 2019). In either scenario, which are not mutually exclusive, certain geoglyph



Figure 11: Geoglyph panel showing a variety of geometric and biomorphic geoglyphs on a slope at Cerro Pintados, near Pica. Photo: P. Bahn, used with permission.

(and petroglyph) types and motifs may have represented particular ethnic or social groups involved in caravan traffic (Briones 2006), possibly serving as symbolic placeholders for such groups during their temporary absence from a given place (Jensen 2003) or marking their access to certain resources (Nuñez and Briones 2017; Nielsen *et al.* 2019). The geoglyphs evidently had an important symbolic dimension, but we will never fully understand the specific meaning of particular geoglyphs panels with their unique mix of depictions of real-world objects, biomorphic figures, some of which featured super-natural elements, and geometric motifs (figure 11). While caravan traffic in northern Chile persisted well into the 20th century (Núñez 1976; Clarkson and Briones 2001), the Atacama geoglyph tradition essentially ended during the Contact Period (AD 1540 to 1550; Briones 2006), so there is no ethnographic evidence for the interpretation of particular geoglyph sites.

3. CONSTANTS AND VARIATIONS IN SOUTH AMERICAN GEOGLYPHS

As the discussion of the contexts of the Nasca and Atacama geoglyphs has shown, both can best be understood in their socio-cultural context. The group rituals on large geoglyph sites in Nasca were markedly different from the caravan traffic through the Atacama desert. In terms of formal repertoire, context, and function, the Nasca and the Atacama geoglyphs seem to have little in common. This is true for their chronological placement as well. While the apogee of the Nasca geoglyphs occurred during the Early Intermediate Period (200 BC to AD 650), the Atacama geoglyphs flourished in the period of Regional Developments (AD 900 to 1450). Thus, the heyday of the Chilean geoglyph tradition occurred when the Peruvian geoglyph tradition had essentially ended.

However, in both regions the earliest geoglyphs date to at least 400 BC, if not considerably earlier, and show close resemblance in terms of origin, motifs, topographic contexts, and function as landmarks. While there is no evidence for a direct link between these regional developments, both can be understood in a broader Andean framework of cultural concepts and traditions. The marking of the landscape through physical signs on the ground has a long history in the Andes that culminated in the famed *ceques* – physical and imaginary straight lines radiating out from the Inka capital of Cuzco and structuring the ritual landscape that surrounded it (Bauer 2000) – and derived spatial markers described in ethnographic

sources (Aveni 1990). Even though both geoglyph traditions took on quite different directions from their shared conceptual origin, two important common traits persisted: movement and visibility.

In both regions, geoglyphs were seen and used by people moving through the desert. In Nasca this movement occurred in large parts upon the geoglyphs, its direction and scope directed by them, whereas in the Atacama people passed by the geoglyph sites while travelling through the desert. Geoglyphs thus had a strong dynamic dimension of which they today seem largely devoid. Except during their construction, neither in Nasca nor in the Atacama were the geoglyphs occupied over long periods of time; rather, they were briefly visited and then left alone until the next visit. During these visits, rituals were certainly held on the Nasca geoglyphs, and probably near the Atacama geoglyphs as well. The geoglyphs, placed in an inhospitable and extreme environment, were thus experienced in a strong and intense yet rather short-lived fashion. Whatever their symbolic meaning, its effect was certainly intensified by these circumstances.

Another common trait is geoglyph visibility. In the Atacama, the sloped terrain on which the large majority of geoglyphs was placed ensured visibility from the surrounding terrain, even though not all details may have been discernable due to a low viewing angle. The repetitive and thus highly recognizable motifs were probably understood even if only parts of them could actually be discerned. The Atacama geoglyphs were thus clearly conceived in relation to observers. The same is true for the Nasca geoglyphs, although in a different way. For a long time, the view *from* the Nasca geoglyphs on their environment was one of their most discussed aspects. The geoglyphs were understood as visual markers of points on the horizon where celestial bodies rose, set, or passed their zenith at important calendar dates (Reiche 1993). Several independent tests found that the orientation of the large majority of geoglyphs cannot be accounted for by this hypothesis (Hawkins 1974; Aveni 1990). A more recent study looking for orientations of geoglyphs to mountain tops, which were likely regarded as sources of water and seats of deities (Reinhard 1996), likewise yielded negative results (Lambers and Sauerbier 2007, 2009). But a clear pattern emerges when one reverses the viewing direction to look *on* the geoglyphs. As GIS-based spatial analyses have shown, most of the Palpa geoglyphs in the northern part of the Nasca basin were clearly placed in such a way that they could easily be seen

from the surrounding terrain (Lambers 2006; Lambers and Sauerbier 2007, 2009). Thus, just like in the Atacama desert the Nasca geoglyphs were meant to be seen. However, considering the overwhelming evidence of group rituals on geoglyph sites, it is plausible to assume that it was these rituals, and the people involved in them, that were the main focus of attention, rather than the geoglyphs themselves.

Both shared aspects, movement and visibility, remind us that geoglyphs can only be understood in their socio-cultural context (Rodríguez 1999; Valenzuela *et al.* 2014). Our modern notion of both the Nasca and the Atacama geoglyphs is heavily shaped by (aerial) images of an empty and uninhabitable desert environment in which the geoglyphs are located in apparent isolation. But two important elements are missing in this picture: the people who went out into the desert to construct and use the geoglyphs, and the recurring activities taking place on or around geoglyph sites. As the examples from Peru and Chile have shown, this context is crucial for an understanding of the South American geoglyphs. It illustrates the varied and complex ways in which ancient societies interacted with their arid environment, transforming it according to their concepts and needs, the traces of which can be appreciated to the present day.

ACKNOWLEDGEMENTS

I wish to express my gratitude to Corrie Bakels and the APL editors for their insightful comments on earlier versions of the manuscript, to Anna Dowden-Williams for her skillful proofreading of the text, and to Lena Lambers and Joanne Porck for their invaluable help with the illustrations. Furthermore I am grateful to Paul Bahn, Markus Reindel and Daniela Valenzuela for their generous permission to reproduce photos from their archives or publications in this article.

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