KEYWORDS: ***Geoglyph – Graphic phenomenon – Manufacturing technique – Mechanical pressure***

GEOGLYPHS: A PHENOMENOLOGICAL APPROACH

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Abstract. This article reviews the background and nomenclature of a specific type of graphic phenomenology currently known as geoglyphs. The properties of these materials, especially their technological variation, are examined here based on examples mainly from Peru and India. The record of the mechanical pressure technique to produce geoglyphs stands out, as it is documented at different archaeological sites, from which it is inferred that this technique had wide use in the past, especially in the Andes. It is concluded that the phenomenological definition of the geoglyphs is substantial in determining the nature of this type of archaeological evidence, with implications for its conservation, treatment and interpretation.

Introduction

Geoglyphs constitute one of the most conspicuous cultural phenomena of the Andes, however, they are not exclusive to this region and particular versions of these kinds of testimonies can be seen throughout America, Asia, Europe and other parts of the world. Although the presence of this evidence is widespread, its phenomenological knowledge is very limited. We seek to demonstrate that this limitation has ultimately prevented its adequate study and understanding. The typical case to illustrate this is Peru, where technical differences in the manufacturing of geoglyphs have been completely overlooked on the tacit consideration that this graphic phenomenon was produced solely by reductive or additive techniques or a mixture of both. This article reviews these assumptions, discusses the limitations of the categorical definition of geoglyph, and examines the main production techniques.

About the technological precision of this evidence, the Santo Domingo site in Trujillo, Peru, is of great importance because most of the geoglyphs at this site were made using a mechanical pressure technique. This manufacturing method has never been noticed in the archaeological record of this country. The extensive and well-preserved evidence of Santo Domingo allows us to infer that the pressure technique could have been used in other places with sedimentary substrates, such as the case of the Río Grande basin in Nasca. Experimental observations support this inference. For Nasca, it is important to consider the degree of alteration this type of evidence has suffered, especially due to its interventions since the 1940s.

We have reviewed archaeological sites in Peru and India to identify variations in the techniques used to produce geoglyphs. We draw particular attention to some sites in India where the phenomenon still requires a categorical definition. Among the most outstanding examples, in addition to Santo Domingo, are the figures of Cerro Campana, in La Libertad, Peru, created from the relocation of *achupallas* (*Tillandsia* spp), a xerophytic desert plant and the carved geoglyphs from Konkan in India, forming zoomorphic designs on a rock floor. As can be seen, technological variation is an important cultural indicator, and it must be adequately recognised, especially from a phenomenological perspective.

Background and definition

The first technical study on the existence of geoglyphs in Peru was presented by archaeologist Toribio Mejía Xesspe at the 27th International Congress of Americanists of Lima in 1939, based on 1927 reports of explorations in the Kopara Valley, carried out as part of the expedition of Dr Julio C. Tello to the Río Grande de Nazca River basin, at the department of Ica (Mejía Xesspe 1940, 2002[1927]; Tello 1942). Months earlier, in 1926, the anthropologist Alfred Kroeber had documented similar marks in the Nazca Valley, in the same basin, but his report would not be published until the end of the 20th century (Kroeber and Collier 1998). Mejía's findings made it possible to distinguish lines and geometric figures on extensive areas of sedimentary soil (Fig. 1), forming the first material reference for this type of evidence, which was progressively discovered along the Peruvian Pacific coast (*yunga* region) and northern Chile (Briones and Alvarez 1984).

The term 'geoglyph', currently used to identify the finds of Mejía Xesspe and others of this type, is a category applied to describe cultural marks on the surface of the ground. The term's etymology is of Greek origin, although the suffix 'glyph' in Spanish is related to the concept of the linguistic sign (see Real Academia

Figure 1. Upper east section of the Kopara Valley plan (Las Trancas, Nasca, Peru), surveyed by Toribio Mejía Xesspe in June 1927. Scale 1/7000 [Original size: 1.30 × 0.43 m]. Note the description of geoglyphs on the right side of the drawing. Taken from Mejía Xesspe (2002[1927]: Pl. II).

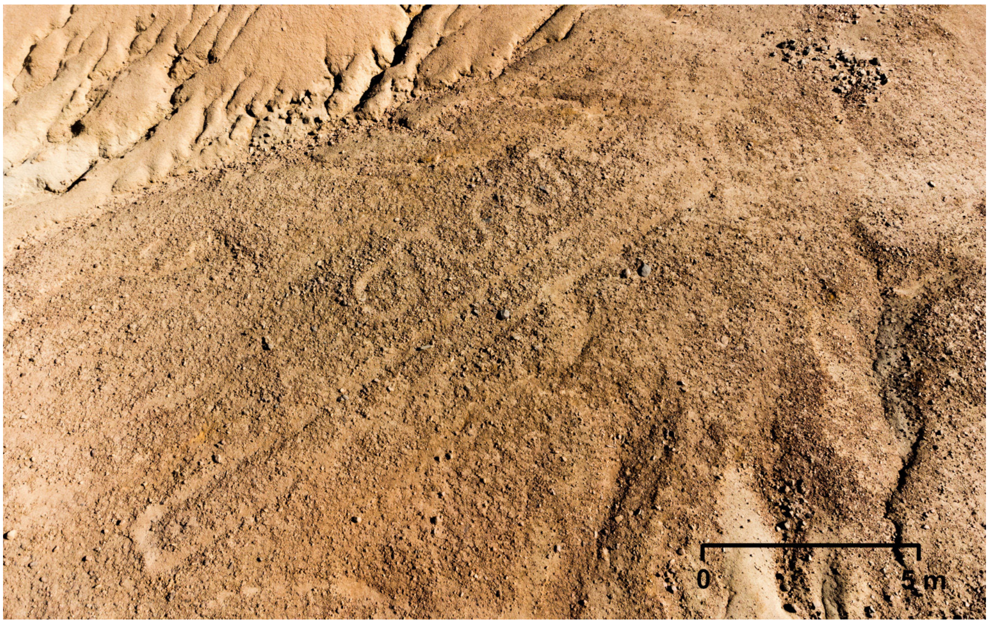

Figure 2. A typical geoglyph in the yunga *región (desertic valley) of Peru. Yanacoto-Chacrasana site, Lima. Photography Edith Claudio Medina, 2024.*

Española n.d.). According to Valenzuela and Clarkson (2014), the first use of this nomenclature was in 1949 by José Cruxent, to be later applied in Chile by Grete Mostny in 1964. According to Eloy Linares Málaga (1973, 1999), this term was formally introduced in 1966 by Grete Mostny and Hans Niemeyer during the First International Symposium of Rock Art in Mar del Plata, becoming a conventional expression for this type of archaeological material. After his discovery in the 1920s, Mejía Xesspe called these marks 'avenues', *ceques* 'ceremonial paths' and 'ceremonial lines', according to what he considered to be the original function of this evidence (Mejía Xesspe 2002[1927], 1940, 1948); being later called 'lines', 'paths', 'triangles', 'trapezoids', 'squares', 'figures' or 'drawings', in a conventional way (Horkheimer 1947; Kosok and Reiche 1949; Reiche 1989[1968]; Morrison and Hawkins 1978; Roselló Truel 1978; Roselló Truel et al. 1985). A pioneering academic use of the term 'geoglyph' in Peru was made by Linares Málaga in the seventies (Linares Málaga 1973).

The term 'geoglyph' has recently expanded even to volumetric materials, some forming figures on the ground (Bednarik et al. 2010; Valenzuela and Clarkson 2014). Examples of these 'classes' of geoglyphs may include, indistinctly, high Andean agricultural embankments (Lennon 1982; Erickson 1986), the earthen mounds of Bolivia and Brazil (Denevan 1966; Erickson 1980; Mann 2000, 2008; Echevarría López 2014); the mounds or 'effigy mounds' of the central and southern coast of Peru (Silva and Massie 1988; Benfer 2013), or the effigy mounds of the Mississippi river basin (Squier and Davis 1998[1848]), among others. However, the relationship between this type of evidence is very ambiguous. We consider that mounds or earth structures with high volumes, whether or not they form figures, should be considered a special and separate phenomenology in archaeological evidence. The link between these testimonies and the geoglyphs is inconsistent, and neither material should be confused.

Regarding its correspondence with rock art, this is also insubstantial. The International Federation of Rock Art Organisations (IFRAO) only considers two types of graphic phenomenology in the so-called 'rock art', defined by its manufacturing technique, between additive (pictograms) and reductive (petroglyphs), leaving the geoglyphs as a particular motif or design produced on the ground using the same techniques (Bednarik et al. 2010), generating marks in high and low relief. In the Peruvian case, Eloy Linares Málaga incorporated geoglyphs as a specific type of rock art within a corpus that also included pictograms, petroglyphs and mobiliary art; the latter, another particular type of artefact with its variants (Linares 1973). However, we consider that the term 'rock art' is in itself problematic to encompass or incorporate complex graphic phenomenologies into its conceptualisation. This is something that has also been seen in the Amazonian case (Valle et al. 2019); therefore, geoglyphs should be considered a separate category of cultural artefact.

The reference of a geoglyph as a graphic mark on the ground can be considered a phenomenological definition. Therefore, the fact that it is regarded as a geoglyph can be recognised by its observable physical characteristics and not by age, cultural association or historical importance. Regarding its nature, we must mention the scale since the best-known geoglyphs are of considerable size, easily exceeding ten metres, as is the case of those that exist on the coast of Peru or other parts of the world (Fig. 2). Although lesser known, small-scale geoglyphs have also been reported in some Peruvian sites such as Toro Muerto in Arequipa (Fig. 3) or Santo Domingo in Trujillo (Linares Málaga 1968; Corcuera Cueva and Echevarría López 2010), where there are motifs that measure less than two metres (Fig. 4). Dr Linares Málaga called these designs 'microgeoglyphs' (Linares Málaga 1974: 129, 1979: 28), but this should be considered a colloquial nomenclature since the scale of the motif does not determine the nature of the graphic phenomenon itself. A geoglyph is such, whether it measures one metre or ten kilometres. The only relevant property

Figure 3. *'Microgeoglyph', at Toro Muerto site, Arequipa. Taken from Eloy Linares Málaga, 1979.*

Figure 4. *Geoglyph at the archaeological site of Santo Domingo, Trujillo, La Libertad. In the image, the archaeologist Víctor Corcuera Cueva. The linear cut of the ground is modern. Photograph by GTE, 2008.*

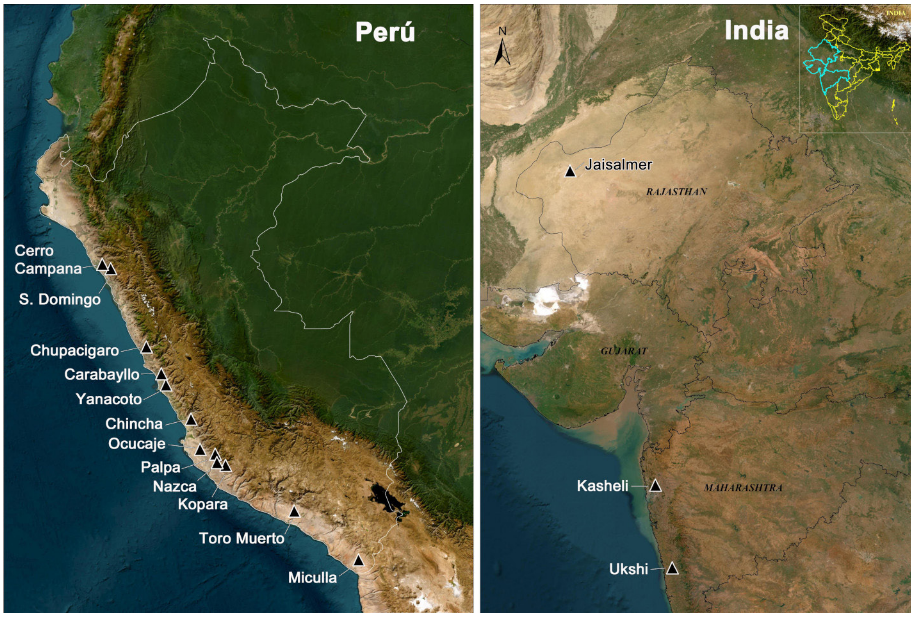

Figure 5. *Locations of the archaeological sites with geoglyphs, from Peru and India, mentioned in the text.*

Figure 6. *Detail of the ground surface that characterises the Santo Domingo site. In the image, archaeological ceramics are in situ. Photograph by GTE, 2008*

in this consideration is that the support of the graphic phenomenon is the ground.

Due to their location and support, geoglyphs can be produced by different methods, with the variants that these procedures and the support allow. The variation in techniques used to manufacture these kinds of marks is outstanding for the Peruvian case, as we will see later, but it does not condition its formal diversity, so it is possible to see a variety of designs regardless of the technique in which they were produced. Currently, geoglyphs are distributed mainly in desert areas of the Andean maritime *yunga* region (desertic middle valleys [Pulgar Vidal 1946]), which includes *pampas* (plains), alluvial terraces in ravines and slopes of mountains or hills. The spatial distribution in the Peruvian case is conditioned by a taphonomic process that has favoured its preservation and current state; therefore, it is inferred that many geoglyphs have disappeared or have been destroyed in other regions by natural or cultural factors.

The oldest geoglyphs so far recorded in Peru corresponds to phase 2 of Lima's rock art sequence (c. 2500–1000 BCE; Echevarría López 2015, 2016), but this is a reference that points out the taphonomic threshold for the phenomenon in the Andes; a phenomenon that is much older. The sample of geoglyphs that we will examine here was selected to illustrate the technical variation of the phenomenon as it currently exists, emphasising some cases with little-known techniques but of value for studies of this material in the Andes and other regions.

Geoglyphs

One of the most interesting examples of geoglyphs is that of the Santo Domingo site, with a long series of graphic evidence produced mainly by mechanical pressure and, to a lesser extent, by the additive technique. The site, located on the left bank of the Moche River in Trujillo, northern Peru (Fig. 5), is formed by a set of alluvial terraces concentrated in a small, closed basin, which also contains archaeological evidence from different periods, including architecture, roads, and surface ceramics (Beck 1979; Billman 1989; Castillo and Corcuera Cueva 2007; Corcuera Cueva and Echevarría López 2010). A peculiarity of Santo Domingo geoglyphs is that most of their motifs are of a reduced scale with variable dimensions in lengths less than 10 m; therefore, it could well be considered a microgeoglyph site, applying the Linares Málaga criterion.

In a report published in *Boletín APAR,* the journal of the Peruvian Rock Art Association – APAR (Corcuera Cueva and Echevarría López 2010), we affirm that reductive techniques were used in these geoglyphs. Still, a better examination of the evidence has allowed us to reevaluate this observation, finding that these images were produced by direct pressure on the ground's surface. This technique has been used in many geometric designs where linear compositions stand out. In the additive technique, semi-naturalistic, anthropomorphous, and zoomorphic designs are also characteristic and differentiated from the former. Both methods have been applied on the same supporting soil.

Figure 7. *Geoglyph with geometric linear design, produced by mechanical pressure. Completely destroyed today. Photograph by GTE, 2014.*

Figure 8. *Area with geometric linear geoglyphs produced by mechanical pressure. Víctor Corcuera Cueva observes one of the most prominent features in the photo. Photograph by GTE, 2015.*

The geomorphology of Santo Domingo is complex, with superimposed sedimentary mantles of alluvial origin forming terraces, many of them cut by runoff and small drift channels that have sectioned the platforms and generated undulating hills. The upper layer of these mantles shows a soft composition with inclusions of small rocks and with flimsy compact surfaces of clasts with a dark brown patination (Fig. 6). This surface has been formed by processes of erosion, weathering, desiccation and compaction, which has left open planes suitable for the production of geoglyphs (see Fig. 4).

The pressure marks on these figures were noticed when examining one of the most diffuse geoglyphs at the site (Fig. 7). In this case, no angular sections or cut profiles were perceived in the relief, but rather a curved continuity between the base of the groove (internal surface) and the exterior ground surface, with a difference in levels that did not reach a centimetre. The main contrast between the internal and external surfaces is that the former present greater uniformity at the level of the tops of their clasts, while the latter expose a chaotic accumulation of clasts with disparate tops. These characteristics were repeated in other similar motifs (Figs 8 and 9). In all cases, the groove's colour is lighter than the outside ground.

To corroborate these observations, one of the largest geoglyphs at the site was examined, which consisted of a motif of three spirals formed by a single line, which was partially destroyed in April 2015 using

Figure 9. *Detail of the geoglyph in Figure 8. Intersection area of grooves produced by pressure. Note the difference between the internal and the external surface, especially the relief and colour of the surfaces. Photograph by GTE, 2015.*

Figure 10. *Geoglyph called 'triple spiral', Santo Domingo site, in good condition. Photograph by GTE, 2012.*

Figure 11. *The same geoglyph as in Figure 10 was partially destroyed by a mechanical plough in the first days of April 2015. Photograph by GTE, 19 April 2015.*

a mechanical plough (Corcuera Cueva 2016) (Figs 10 and 11). The examination revealed that the substrate has a soft hardness, with no observable evidence that any part of the soil has been removed or broken during the production process of the figure. A superficial cleaning of the rubble area also revealed that the clasts were caked in a laminar clay crust, which holds these rocks like a cookie (Fig. 12). The layer must have been formed by the compaction of the soil under the clasts and the pluvial dynamics of the area. Under this crust, the soil is soft with inclusions of stones in a chaotic manner, which can be seen in the exposed profile (Fig. 13). Just as on the surface, the rocks in the layer show different sizes, and their position is random in the substrate.

Based on this evidence, we can infer that the surface of the layer, the support of the geoglyphs, was formed through the erosion of the soil and by the process of natural sedimentation and compaction of the rocks,

Figure 12. *Clay layer with clast incrustations that constitutes the base for the superficial accumulation of clasts in the Santo Domingo pampa. Photograph by GTE, 2015.*

which has left an irregular level in the position of the clasts. There is no evidence that the same natural process has taken place inside the groove, which would have left a surface of clasts with irregular heights forming a non-uniform level. Since there is a matted clast surface inside the groove, it is evident that this was formed by mechanical pressure on the soft surface of the sedimentary mantle, which is what we perceive as a graphic phenomenon.

An experimental, observational study on this type of mark was carried out in March 2023 at the Kopara or Las Trancas valley, Río Grande de Nasca River basin, in Perú, which is the area where this type of cultural evidence was initially discovered in 1927. In this area, we examined the imprints of cars and footprints on an alluvial sedimentary mantle similar to that of Santo Domingo. This mantle was located parallel to the riverbed forming a raised terrace (Fig. 14). The geology of the area is very similar to that of Santo Domingo, although with its particularities, so it can be seen that it shares the same type of sedimentary soil, with strongly patinated clasts and rock particles in the surface of the layer, which sits on a sandy silt stratigraphic substrate of soft hardness. A similar stratification can be observed in the Nasca Valley (Grodzicki 1992, Delle Rose 2016). In this case, the main geosystemic difference between Santo Domingo and Río Grande is the precipitation regime, which is almost absent in the case of the Nazca basin.

When the marks in Kopara were examined, we noticed that the pressure of the vehicle's wheels generated a levelling effect on the internal surface of the marks, which became grooves. Therefore, the base of the groove shows a uniform level at the top of their clasts, forming a singular plane, unlike the external sur-

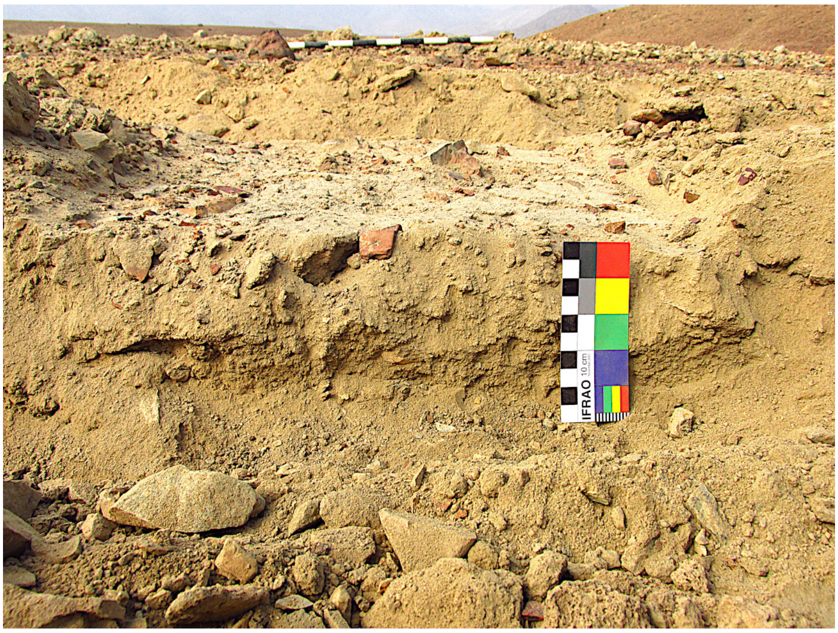

Figure 13. *The profile of the cut made in the triple spiral geoglyph shows the crumbly clay layer (see Fig. 12) and the loose earth substrate composed of sediments with random inclusions of clasts. Photograph by GTE, 2015.*

Figure 14. *Panoramic of Kopara River valley, Ica, one of the tributaries of the Rio Grande de Nazca River. In the foreground is the sedimentary terrace on the right bank of the riverbed. The sedimentary platform surface is composed mainly of patinated clasts and rock particles. Photography by GTE, 2023.*

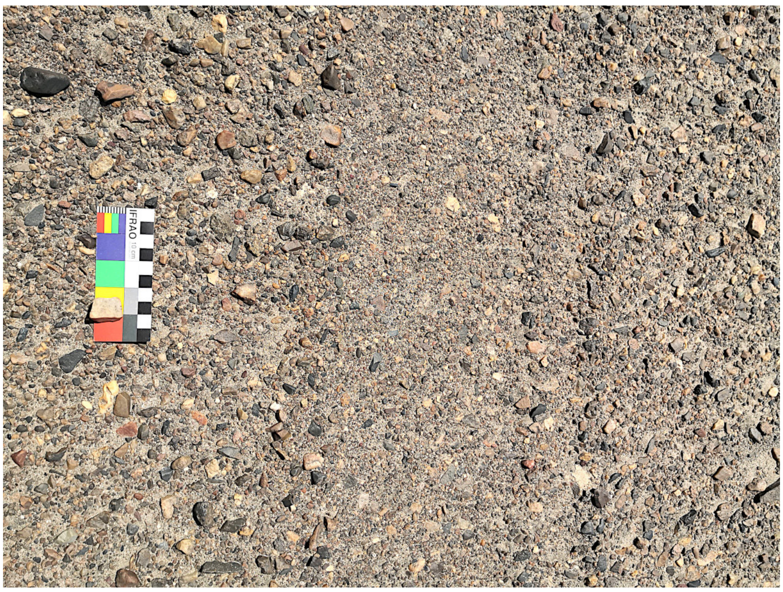

Figure 15. *Pressure mark of a motor vehicle on the rock surface of the sedimentary mantle of the Kopara Valley. The tyre only lowered the surface without breaking the layer, creating a groove with a more level surface than the outer ground. Photograph by GTE, 2023.*

Figure 16. *Tyre marks produced by a motor vehicle. In this case, the tyre broke the resistance of the surface layer, sinking the clasts and exposing the sedimentary substrate of silt and sand. Photograph by GTE, 2023.*

Figure 17. *Exposed sedimentary substrate is produced by striking the surface of the sedimentary mantle at the Santo Domingo site. In essence, this is the same phenomenon observed as in Figure 16. Photograph by GTE, 2023.*

face (unaltered), which maintains a random arrangement at the tops of the clasts that form it (Fig. 15). This is the same effect observed in the geoglyphs of Santo Domingo and occurs when the pressure is strong enough to slightly overcome the resistance of the substrate, which depends proportionally on the hardness of the layer and the pressure exerted on it. This explains why human footsteps can generate this type of mark. When the pressure is excessive due to the weight of the vehicles, for example, the resistance of the layer is broken and the clasts are pressed into the substrate, leaving a surface of earth formed by clay, silt and sand (Fig. 16). This effect can also be observed when the surface of the layer is hit, causing the soil substrate to be expelled upwards, covering the affected area and making the surface dusty; something that we were able to corroborate before in Santo Domingo (Fig. 17).

From here, it is possible to infer that producing grooves by pressure, with an average of 30 cm wide, could be carried out by exerting continuous and stable compression by mechanical force without problems, and even human weight could likely have been used to achieve this. It is logical now to conclude that the Santo Domingo geoglyphs were produced using this technique. On the other hand, having similar physical conditions, we infer that some geoglyphs in the Nasca River basin were made using a similar technique. Some records in the Palpa area near Nasca have corroborated the strong compaction at the base of the geoglyphs lines, even suggesting that people walking produced this property, although definitive evidence has not yet been provided (Reindel et al. 2006: 91, 99), so this hypothesis must still be tested.

The main problem for examining the geoglyphs of Nasca is the intense alteration they have suffered since the 1940s. Indeed, Päul Kosok and Maria Reiche describe how they reworked the geoglyphs using boots or a drag stone to deepen the grooves for better visualisation. According to these authors:

> It then became necessary to locate the best-preserved parts and start 'marking' them. This was done by shuffling along them with our heavy boots or by dragging behind us a large stone attached to a rope. As a result, the darker surface layer of the dirt was pushed aside thus exposing the lighter col-

Figure 18. *Detail of the groove that forms the geoglyph at the Yanacoto-Chacrasana site, formed by mechanical pressure. Most of the clasts of the surface are levelled. Photography by GTE, 2024.*

Figure 19. *Line section of geometric geoglyphs in Altos de Carabayllo, Lima. The image shows that the area has been cleaned of large rocks and delimited with clasts. No excavation was carried out. Photograph by GTE, 2018.*

Figure 20. *Archaeological site with geoglyphs of Yanacoto, Lima. In the central upper part of the image, a clean area of large clasts can be observed, which has not been delimited by additive procedures. Photograph courtesy of Edith Claudio Medina, 2022.*

ored soil beneath. The well-defined parts of the path could thus be more clearly seen and with enough patience the rest of the path making up the figure could often be traced (Kosok and Reiche 1949: 208).

The preceding description clarifies the degree of transformation to which the Nasca geoglyphs have been subjected, whose removal has modified the volumetry of the lines, their limits and, therefore, their primary perception. This has practically generated a new drawing that can be seen at a photographic level

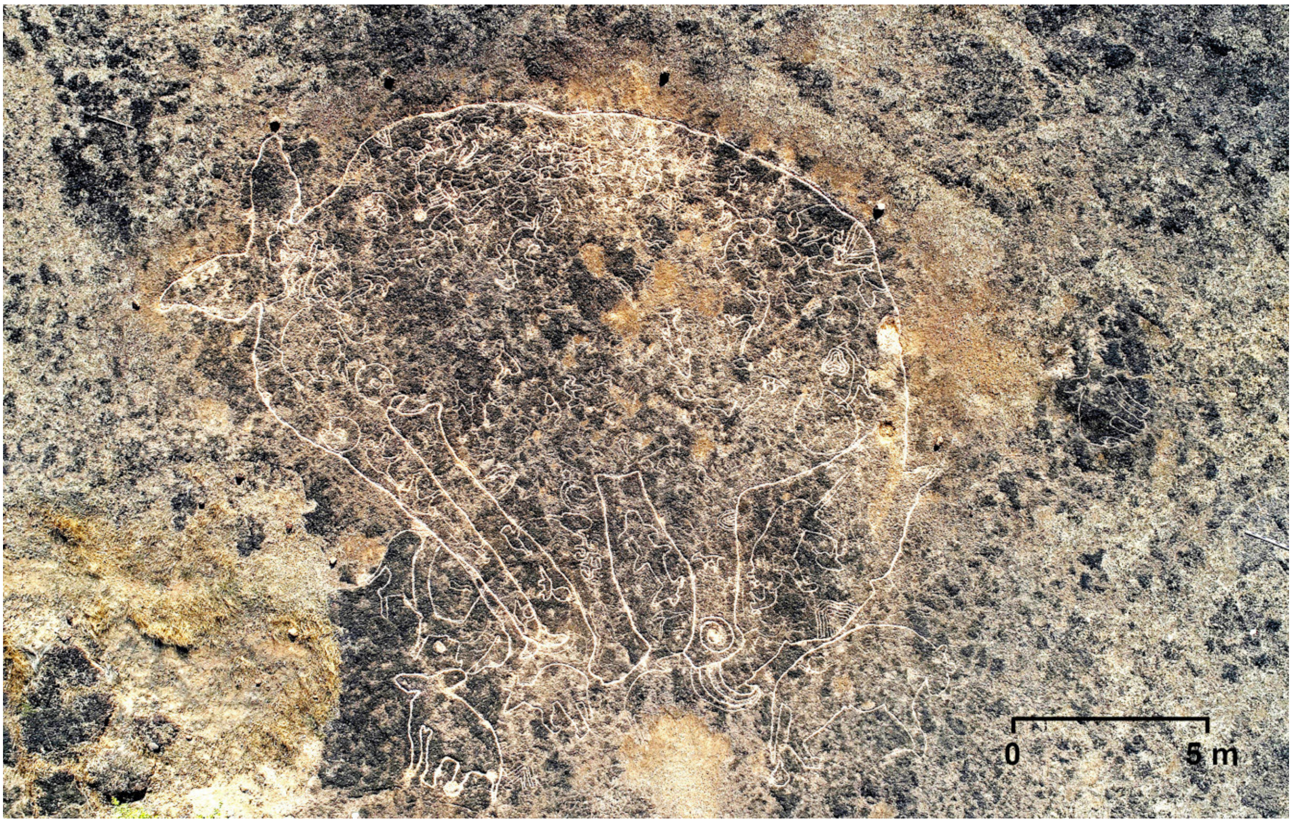

Figure 21. *Konkan figurative motifs on the ground, India, produced by linear carving. Photograph courtesy of Rhutvij Apte, 2019.*

Figure 22. *Konkan relief motif produced by area carving. Photograph courtesy of Rhutvij Apte, 2018.*

(Reiche 1989[1968], photograph p. 67). Other forms of alteration, also mentioned by Reiche, have been the sweeping and removal of clasts from the original marks (op. cit., p. 25, 40). The modification of this evidence (lines and drawings), made through the interventions of amateurs and archaeologists, is so severe and widespread that it still needs to be quantified today.

On the central coast of Peru, mechanical pressure marks for producing geoglyphs have been verified at the Yanacoto-Chacrasana site (see Fig. 2), where the use of this technique has left a level and uniform surface of clasts in the grooves that form the figures (Fig. 18); a characteristic feature for this type of technique. The presence of pressure geoglyphs in Lima allows us to infer that this type of manufacturing had a wider distribution, something that should force us to review the parameters for the recognition of the production of geoglyphs everywhere.

Reviewing technical diversity, examples of the application of reductive methods, that is, removing mass to produce geoglyphs, can be seen in different parts of Peru (see Fig. 5). In Ocucaje, Ica, this procedure has been carried out by removing rocks to create clean areas which are delimited by clasts added to the margins, so the complete design uses more than one technique (Vargas and Echevar-

Figure 23. *Geoglyphs of Jaisalmer, Rajasthan, India. This image is from Boha. The lines are about 10 km long, and they are the result of reductive and additive techniques. Photograph by SKT, 2022.*

ría López 2012). This same method has been described for Nasca, among others, by Mejía Xesspe (2002[1927], 1940); Horkheimer (1947); Aveni (2000); Silverman (2002); Rink and Bartoll (2005); Reindel et al. (2006); Greilich and Wagner (2009); Masini et al. (2016). A similar procedure was applied at Altos de Carabayllo in Lima, where the clasts were removed from the graphic area (line), leaving a differentiated surface (Fig. 19). At Yanacoto, Lima, this procedure was executed, but without an obvious additional delimitation (Fig. 20), making it more difficult to perceive the modified soil at ground level. In these examples, no excavation or removal of substrate has been recorded.

In places like India, where this graphic phenomenon is becoming increasingly noticeable, geoglyphs have also been produced in various types of soil. Sites like Ukshi or Kasheli in the Konkan region (Mascarenhas and Shirodkar 1995; Lalit 2013; Garge et al. 2018) exhibit zoomorphic designs produced by cuts on the rock surface that form the regular floor of the site (Fig. 21). There are also figures of different sizes in relief achieved by carving different areas, creating a completely different visual design (Fig. 22). In numerous cases, the figures have been produced by carving in the ground's surface, forming lines which visually remind us of the petroglyph grooves made by percussion; however, some Indian authors maintain that these are geoglyphs.

In the Konkan region, we consider the use of hammerstones to pound petroglyph grooves directly into the laterite surface. The resultant grooves were broad, deep and slightly irregular in width. It seems that the indirect percussion technique was also used. This technique yielded deeper and smoother grooves than direct percussion, with sharper edges and a more consistent width. The indirect percussion technique used metal tools and yielded grooves with vertical sides, sharp edges and a flat bottom. A different case is that of the Jaisalmer geoglyphs in Rajasthan (Oetheimer and Oetheimer 2021), which are located on a sedimentary mantle (Fig. 23). The site, formed by lines up to 10 km long and 40 cm wide, has been produced by slightly removing the surface layer and accumulating clasts and sediments at the edges, therefore also involving additive procedures (Fig. 24). The line, however, is

Figure 24. *Detail of one of the lines of Jaisalmer. The relief and the edges of clasts and sediment can be noticed. Photograph by SKT, 2022.*

Figure 25. *Geometric geoglyph created in additive technique, by placing clasts in a linear arrangement. This figure is completely destroyed today. In the image, Víctor Corcuera. Santo Domingo site. Photograph by GTE, 2008.*

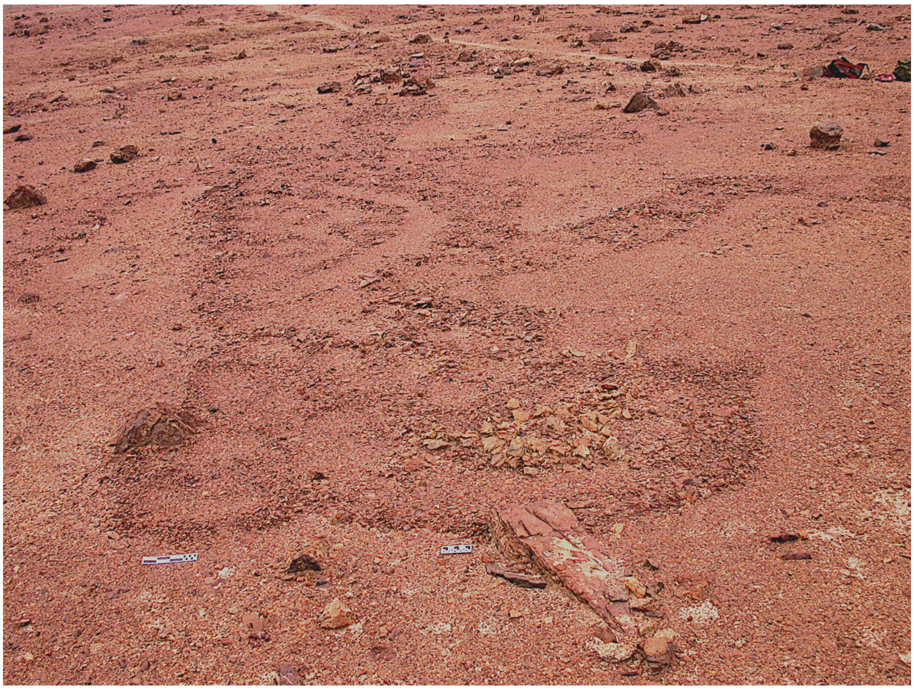

Figure 26. *Figurative geoglyph in the complex additive technique, created from the placement of layers of rammed clasts. Santo Domingo site. Photograph by GTE, 2008.*

covered with vegetation, so the original procedure is difficult to determine today.

In Peru, additive techniques include designs using clasts to delimit areas or to form lines by a row of rocks, which is also seen in the Santo Domingo site (Fig. 25). Still, these are relatively simple procedures that are frequently used in association with other methods as we have already seen in the cases mentioned above. More complex examples of this technique allowed figures to be created through the accumulation of clasts, forming small mounds or 'dots' in the landscape, as has also been seen in Chincha, Ica (Stanish and Tantalean 2020), or through layers of clasts on the surface to form the figures, as seen in Santo Domingo; in Chupacigarro, Lima (Shady et al. 2003); or in Palpa, Nasca (Reindel et al. 2006); a technique also common in the geoglyphs of northern Chile (Mostny Glaser and Niemeyer Fernandez 1983; Briones Morales 2007). In Santo Domingo, this last technique is very elaborate, having documented a superposition of clast layers to produce figures, which makes the designs more detailed (Fig. 26). These layers have been compacted or tamped against the surface, giving the motifs a level of uniformly textured appearance.

Another interesting additive technique was documented in the desert sands of Cerro Campana, in the interfluve of the Moche and Chicama rivers in Peru (Echevarría López and Corcuera Cueva 2011a, 2011b). It consisted of figures arranged by xerophyte plants called *achupallas* (*Tillandsia* spp), forming geometric and anthropomorphic designs (Figs. 27). Although the archaeological origin of these geoglyphs has yet to be corroborated, the life cycle of these plants can likely sustain the long permanence of the designs. Due to its easy manipulation and transfer (Hinojosa Talavera 2021), this vegetation has been used to create figures even today, such as those observed on the slopes of the hills of the Caplina River basin in Tacna, southern Peru, which maintained their designs for decades. Under the right conditions, *achupayas* can maintain stable forms of their living communities for hundreds of years (M. Hinojosa, pers. comm. 2024).

Figure 27. *Anthropomorphous geoglyphs produced by accommodation of* achupallas *(*Tillandsia paleacea*). Cerro Campana archaeological site, Trujillo. Photograph by GTE, 2011.*

Conclusions

Like petroglyphs or pictograms, geoglyphs are the product of a particular human behaviour, and their complex phenomenical nature is also characteristic of that behaviour. As a category of artefact, geoglyphs encompass a specific set of technical properties that cannot be reduced to additive and reductive procedures or the simultaneous use of both in the production of these testimonies. Their technical complexity individualises the material, which should not be confused with other testimonies of large volumetry or what has come to be called rock art in modern times.

Although the diverse technical nature of geoglyphs may now seem obvious, there is a limited understanding of their materiality due to a poor perception of the phenomenon, especially due to little interest in examining this evidence in detail. The most eloquent case is that of the geoglyphs of Peru, whose technical particularity was almost reduced to simple extractive methods. Although this could have been conditioned by the systematic destruction of the Nasca geoglyphs, the extraordinary number of geoglyphs existing in this country does not allow us to support this current state of knowledge. As has been seen in such cases as Santo Domingo or Yanacoto-Chacrasana, geoglyphs have been produced by methods other than additive and reductive, such as mechanical pressure. The alteration of the earth's surface to create geoglyphs must include the modification of the mass of the support and not only its addition or subtraction.

The technical definition of this type of manufacturing used in geoglyphs will undoubtedly have significant cultural implications. In 1927, the archaeologist Toribio Mejía Xesspe proposed that this evidence could constitute ceremonial roads or avenues, the first functional interpretation of Andean geoglyphs in history. It is currently possible to implement this hypothesis based on what we have observed in some Peruvian sites. Up to this point, we need to recognise that this evidence must be better analysed from a phenomenological perspective, especially to implement appropriate protection and conservation measures, before they continue to be transformed by modern interventions, poor 'restorations', or the absolute destruction of their originality, as they are generally irreparable.

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