

STUDIES OF NAZCA

The Lines of Nazca. Edited by Anthony Aveni (The American Philosophical Society, Philadelphia, 1990). Pp. 343. \$60.

The large lines and figures drawn in the desert of southern Peru near Nazca have long puzzled laymen and scientist alike. The mystery of their meaning has led to countless articles and numerous books and also to their becoming one of the best known archaeological complexes of South America. In his preface to the book *The Lines of Nazca* the editor, Anthony Aveni, asks the question, "Why, then, another book about Nazca?" The articles that constitute this impressive volume provide what he felt was needed: more documentation, a re-examination of old explanations in the light of new evidence, and more information about the cultures that resided in the Nazca region being utilized in discussions of the lines.

The chapter by Anthony Aveni on the results of his research is one of the most important contributions yet to appear on this topic. Aveni distinguishes the types of geoglyphs ("earth drawings") under discussion (mainly straight lines, geometric figures and biomorphic figures) and demonstrates how they relate to one another. He devotes little attention to the biomorphic geoglyphs, presumably because these were in a small section of the pampa where he was unable to work and perhaps because they were not susceptible to statistical methodology and an alignment study. He does, however, systematically present and analyse the physical characteristics of a large body of lines. The tables, histograms, maps, and photographs supply a mine of information accessible to the specialist and non-specialist alike. One of the main findings of his work is that there is a surprising amount of order to the lines: they are not the confused maze that they at first appear. The vast majority of the straight lines are linked to centres of radiating lines, the ray or line centres, of which more than sixty have been recorded.

These centres have been examined carefully by Aveni to test the astronomical alignment theory, that is, to see if lines had statistically significant correlations with celestial bodies. The results are generally negative, a marginally positive result occurring only with one of the zenith passages of the sun. Aveni argues convincingly that the natural terrain did not influence the clustering of lines at ray centres, and he notes practical evidence against a general astronomical use of the lines: the unusually great lengths and widths of some lines (and, he could have added, the short lengths of others), and the prevailing haze on the horizon.

A key part of Aveni's work deals with geometric figures (trapezoids, triangles and rectangles). Taken together, these represent some 3.97 million m² of stone removal: a typical figure possesses an area in excess of 16,000 m².

After examining their physical characteristics and noting how they relate to other features on the pampa, Aveni turns to a study of their alignments. His

analysis reveals a strong correlation between the orientations of these figures and the direction of water flow: 60% point upstream and 40% point downstream. This result is related to the fact that the line centres were located at significant points on the pampa (such as bends in rivers and places overlooking rivers) that delineated the flow of water over it. The combination of the association of line centres with water and the orientations of geometric figures with the water flow lead Aveni to the conclusion that the Nazca lines as a whole were probably intended to be walked over as part of rituals related to the bringing of water to the Nazca valley and perhaps to associated mountain worship.

Although Aveni's work is on the whole thorough and well argued, a few points seem to me problematic. One relates to his separation of the biomorphic figures from the lines both in terms of time and of the people who made them. This interpretation relies heavily on Clarkson's study to be discussed below, but recent work has shown that at least some lines were constructed at the same time as the figures, and this has been accepted by Aveni in a recent article (Aveni and Silverman, 1991).

Another problem relates to the fact that the azimuths of lines are taken looking out from the centres, and the opposite azimuths were not considered. This leaves an unfortunately large corpus of data unexamined. Although Aveni stresses in different parts of the book the need to study the Nazca lines within an Andean context, he does not refer, at least in this regard, to published material which demonstrates current-day use of lines in the Andes (Reinhard, 1988) nor to archaeological evidence supporting the same kind of use in the region of Nazca. Ethnographic evidence points to the lines generally leading *towards* a hill, although of course the opposite direction was utilized to return to the place from which the person began walking. If the complexes of lines were used for rituals, as Aveni notes, then it would seem more logical for the lines to be leading towards a place of worship, i.e. the centre. Despite the absence of excavations, the surface archaeological evidence collected by Clarkson and others supports this interpretation, since hilltops, including those at the centres of lines, were often found to have cultural remains. The emphasis on lines leading out might have arisen because it would not seem logical for lines to lead up to a higher point if they were being used for astronomical purposes. The possibility of the top of the line centre (most of the centres were on hills or mounds) being itself used as a sighting point is not examined and in any event need not have been an obstacle to observations, bearing in mind that the average length of a line was 1.3km and the altitude of the horizon generally only about 3°.

Aveni may have been influenced to view the lines as projecting out from a centre by his research on the system of radial lines (the *ceque* system) the Incas constructed at Cuzco, where this was indeed the case. However, the analogy with the *ceque* system seems to me to have been too closely adhered to. This is an important point to make because the analogy has played a role in the interpretations of several writers on the Nazca lines, including some in this book, although Aveni has indeed utilized the data here in a most detailed

comparative study. The number of *ceque* lines and the sacred sites along them appear not only to have been utilized in the organization of social groups and distribution of water rights in Cuzco: they may also have served a calendrical purpose. According to Aveni and Zuidema, some of the *ceque* lines were aligned with significant celestial bodies at certain important times of the year. A problem arises in that a careful study of these supposed alignments demonstrates that they did not take place within even a couple of degrees of arc (Dearborn and Schreiber, 1989): the alignments would be just as likely to have occurred by chance. As Ruggles points out in a later chapter, for tolerances of 2° and 3° about half of the horizon is within the allowed tolerance of a solar or stellar target, and these targets are themselves clustered around the eastern and western parts of the horizon. Thus low nominal probabilities at 2° and 3° may simply reflect other factors. It seems strange that Aveni is more strict on alignments at Nazca (needing one degree of arc to be noted as valid hits and considering the astronomical theory invalid there because these do not occur in statistically significant numbers) than he is at Cuzco, where the radial system was established much later. In any event, the analogy does not hold that some lines were astronomically aligned for the *ceque* system in the same way as some appeared to have been at Nazca.

A further problem relates to the alignment of geometric figures with water flow. It would seem to me that there would be a natural tendency for people working on the pampa roughly to align the wide trapezoids and triangles with the sections of land on which they were built. It is also possible that the alignments with water flow could have been influenced by the fact that some were sandwiched between gullies, as is visible in some photographs in the book (e.g. Figs L.12b and c). It is unclear how many of these cases exist and thus how much they could have affected the statistical results.

In the first chapter of the book Aveni provides a critique of earlier work relating to the Nazca lines. This seems to me to be generally balanced, although there is at times a tendency to misrepresent and oversimplify some studies. For example, on the basis of Aveni's description, a reader would think that Tony Morrison was a supporter of the astronomical alignment theory. However, Morrison felt that only some of the lines could have been so utilized and instead searched for an explanation based more on ethnographic data. And, despite agreeing with my own interpretation, Aveni mistakenly focuses on a minor point raised in my work which does not represent my conclusions about the lines as a whole. Curiously, he spends more space examining a theory which few scholars, if any, find scientifically acceptable — namely the race track theory of Georg von Breunig — than he does discussing work that supports his own results.

The chapter by Clive Ruggles takes a statistical look at the factors that might have influenced the layout of the Nazca lines and thus complements the work of Aveni. Ruggles has presented the clearest account I have seen of the strengths and weaknesses of statistics as applied to the lines that radiate out from line centres. When examined as a whole, no preference was established for alignments of the lines with the sun or other stars, nor towards mountains or water

flow. However, when the *wide* lines were examined, Ruggles found that there is a "strong general evidence of an interest in the upstream-downstream axis manifested in the directions of wide lines relative to the local water-flow direction". Ruggles's findings about the wide lines thus agree with Aveni's relative to geometric figures — which are themselves wide. As I mentioned above, this assumes that the geoglyphs were not influenced by the local terrain to have such an alignment. According to Ruggles, this is unlikely in the case of the wide lines.

Of interest for the astronomical alignment theory is that Ruggles does find a couple of *specific* ray centres with lines that appear to demonstrate a correlation (1° – 2°) with a solar or stellar rising or setting position of interest. There is one ray centre that has a striking correlation of 1° accuracy for A.D. 1000, of interest in relation to Clarkson's conclusion that the majority of the ray centres were built in the Late Intermediate Period (c. A.D. 1000–1475). Ruggles also makes the interesting point that there existed over-regularity in the case of three line centres, that is, an indication that the centres had their lines deliberately spread evenly around the points of the compass.

The general conclusion I reached after reading this carefully presented statistical study is that (assuming the lines were orientated out from a line centre) the lines are either random or are clustered in directions that do not have to do with factors for which there is a ready explanation. Only specific ray centres give evidence suggesting astronomical alignments and other factors could have influenced these findings. In short, the article supports the general conclusion reached in the book that no single approach will explain the Nazca lines. Ruggles plans to apply in a future publication a different statistical approach (the Bayesian one) to the Nazca azimuth data, and this might shed further light on what must rate as one of the most difficult subjects in the field of archaeoastronomy and statistics.

The chapter by William and Gerald Johnson and Douglas Meisner discusses different kinds of aerial photography and their advantages and disadvantages as applied to the Nazca lines. The article will clarify questions many have as to how the lines could be photographed in a way resulting in a complete coverage without major distortion. A photomosaic is included in the jacket pocket of the book and it has the ray centres indicated on it. This is a valuable addition and allows the line centres to be examined relative to geographical features of the pampa and compared with the line drawings that illustrate the articles.

The chapter by Persis Clarkson provides the data that many archaeologists have long been waiting to see. She has collected information on cultural remains associated with the lines over a large area. Although sherds had been collected during an earlier investigation undertaken by Gerald Hawkins, they were obtained from a limited area of the pampa and their context was unknown. Clarkson has presented the data which for the first time describes sherds, lithics, stone structures, and cairns. She clearly describes their locations and associations, while also providing carefully reasoned interpretations.

As Clarkson notes, the dating of the lines based on surface ceramics is problematical: the sherds could have been deposited later or earlier sherds could

have been removed because of re-use of the lines. However, given the lack of other evidence, sherds do provide the best available clues for the age of the lines or at least when they were last used. On the basis of her sample of sherds and the tendency for linear geoglyphs to overlie figural ones, she concludes that the former were made during the Nazca period and the latter constructed following it.

One of the difficulties she lists is that her sample is limited because it is based on surface finds and because the vast majority of biomorphic geoglyphs were found in a small area where she was unable to work. This was the area where Hawkins made his collection and which resulted in his conclusion that the majority of the lines were made during the Nazca period. Clarkson feels that his collection related mainly to the biomorphic geoglyphs. Unfortunately, work conducted by Helaine Silverman (1990) in another area became available only after Clarkson's work was in press. Silverman has collected evidence, briefly referred to in her chapter in this book, that both the linear and the biomorphic geoglyphs were constructed during the Nazca period. This does not affect the presentation of Clarkson's results, rather only one part of their interpretation. Her findings still indicate that linear geoglyphs continued to be made, or at least reutilized, long after the biomorphic ones. As Silverman notes in her chapter, if the lines were cleaned, as described in the chapter by Urton, only the more recent pottery would remain.

Clarkson concludes that it is difficult to define the functions of the geoglyphs on the basis of the kinds of ceramics (or other cultural items such as lithics and stone structures) found in association with them. Although many vessels appear to have been used for water storage, this could be explained by the need to drink water on the arid pampa. The vast majority of the cultural remains have been found on or around the line centres. Together with the work of Silverman noted above, Clarkson's clear presentation of the archaeological data is the best available for the Nazca geoglyphs and will remain for a long time to come the basis for any archaeological study of the lines.

The chapter by Gary Urton presents for the first time a detailed examination of the social organization that might have been utilized in the construction and maintenance of the geoglyphs. His study draws on ethnographic data from the Andean highlands which is then placed in the historical context of social organization on the Peruvian coast and the Nazca region during the period following the Spanish conquest. It is the attention to detail, the marshalling of little-known documents, and the care taken in their interpretation that distinguishes Urton's work from most ethnoarchaeological studies.

The conclusions he reaches are that social groups interacted on the lines on ceremonial occasions and, in the process of this interaction, helped in their preservation. The groups could have been involved in periodic sweeping of the lines, although even the walking of them would have contributed to their remaining visible. Some are clearer than others, presumably owing to social groups abandoning ritual use of the lines or perhaps in some cases to differing effects of winds and soil composition (such as on the Pampa de Atarco). If his theory is correct, then it follows that pottery found on the lines could postdate

their original construction. Urton makes the point that the lines might have been a focus for working out the distribution of space and resources among the social groups of the river valleys.

In the chapter by Helaine Silverman, the archaeological site of Cahuachi is examined and then related to the geoglyphs on the pampas to the south and north. Cahuachi was the largest known site of Nazca culture and thus its study is of critical importance for our understanding of the people involved in the construction of the Nazca lines. Silverman conducted a series of test excavations in some 85% of Cahuachi's total area and found no evidence of a large residential population. (It is not clear if a survey was conducted beyond the site area to see if a settlement could have existed in land further out from Cahuachi. Of course, even if this were the case, it would not affect her findings within the area of Cahuachi itself.) This has led her to the conclusion, contrary to that reached by some archaeologists, that Cahuachi was a ceremonial centre without an urban component, one that was probably visited periodically by pilgrims. She then utilizes ethnographic analogy to demonstrate how the site could have functioned and the ways that social groupings could have interacted at it.

Aside from the detailed presentation of the result of her original research at Cahuachi, Silverman's article is also valuable for its demonstration of a direct link between a Nazca ceremonial centre and the lines. These data, along with results of her work on the other side of the pampa in the Ingenio Valley, allow her to demonstrate that linear geoglyphs were indeed made by the Nazca culture. Her article is replete with ethnographic and historical data which she uses to situate Cahuachi and the geoglyphs within a broader Andean context. She concludes by providing a convincing explanation for the location of this important ceremonial centre.

In conclusion, the combination of uniformly well-researched articles and the detailed presentation of empirical data makes this an excellent reference work. It has the considerable merit of placing these data within a broader Andean context, thereby making the text of value for anyone interested in Andean cultures. The quality of the letterpress is excellent, as is the clarity of the drawings and photographs. The book is made to last and is easily worth its cover price.

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