The Nazca Drawings Revisited: Creation of a Full-Sized Duplicate

Re-creation of a 440-foot Nazca figure on a Kentucky field shows how the Peruvian drawings were most likely made.

Joe Nickell

Called "Riddles in the Sand" (*Discover* 1982) they are the famous Nazca lines and giant ground drawings etched across 30 miles of gravel-covered desert near Peru's southern coast.

The huge sketch-pad came to public prominence in Erich von Däniken's *Chariots of the Gods?*—a book that consistently underestimates the abilities of ancient "primitive" peoples and assigns many of their works to visiting extraterrestrials. Von Däniken (1970) argues that the Nazca lines and figures could have been "built according to instructions from an aircraft." He adds: "Classical archaeology does not admit that the pre-Inca peoples could have had a perfect surveying technique. And the theory that aircraft could have existed in antiquity is sheer humbug to them."

Von Däniken does not consider it humbug, and he obviously envisions flying saucers hovering above and beaming down instructions for the markings to awed primitives in their native tongue. He views the large drawings as "signals" (von Däniken 1970) and the longer and wider of the lines as "landing strips" (von Däniken 1972). But would extraterrestrials create signals for themselves in the shape of spiders and monkeys? And would such "signals" be less than 80 feet long (like some of the smaller Nazca figures)?

As to the "landing strip" notion, Maria Reiche, the German-born mathematician who for years has mapped and attempted to preserve the markings, has a ready rejoinder. Noting that the imagined runways are clear of stones and that the underlying ground is quite soft, she says, "I'm

Joe Nickell teaches technical writing at the University of Kentucky. A former professional stage magician and private investigator, he is best known for his research on the Turin "shroud" and is the author of Verdict on the Shroud, *published by Prometheus Books earlier this year.*

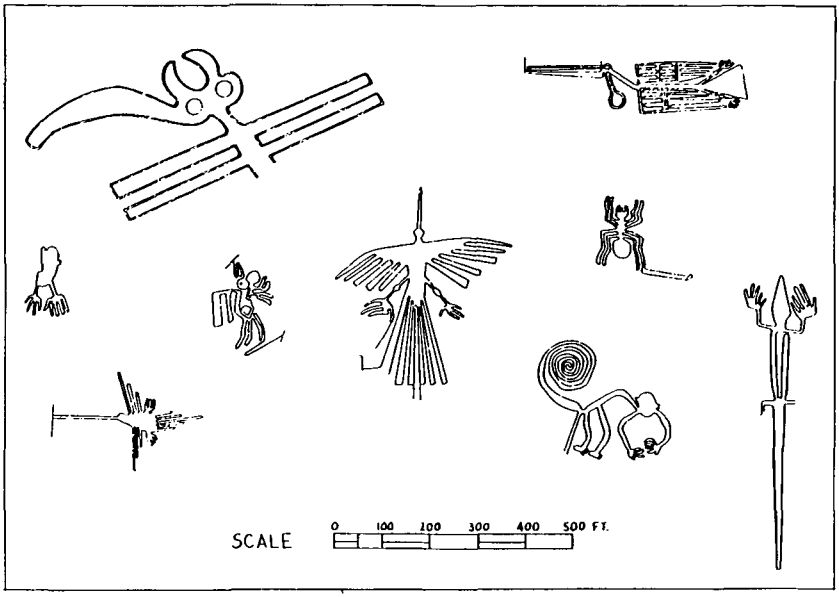

FIGURE 1. Etched upon the Nazca plains in Peru are giant drawings like these. Their large size has fueled misguided speculation that they were drawn with the aid of "ancient astronauts" or by sophisticated surveying techniques, the secrets of which are lost.

afraid the spacemen would have gotten stuck" (McIntyre 1975).

It is difficult to take von Däniken seriously, especially since his "theory" is not his own and it originated in jest. Wrote Paul Kosok (1947), the first to study the markings: "When first viewed from the air, [the lines] were nicknamed prehistoric landing fields and jokingly compared with the so-called canals on Mars." Moreover, one cropped photo exhibited by von Däniken (1970), showing an odd configuration "very reminiscent of the aircraft parking areas in a modern airport," is actually of the knee joint of one of the bird figures (Woodman 1977). (See Figure 1.) The spacecraft that parked there would be tiny indeed.

Closer to earth, but still merely a flight of fancy, in my opinion, is the notion of Jim Woodman (1977) and some of his colleagues from the International Explorers Society that the ancient Nazcas constructed hot-air balloons for "ceremonial flights," from which they could "appreciate the great ground drawings on the *pampas*." If one believes that the theory is also inflated with hot air, one must at least give Woodman credit for the strength of his convictions. Using cloth, rope, and reeds, Woodman and his associates actually made a balloon and gondola similar to those the Nazcas might have made had they actually done so. Woodman and British balloonist Julian Nott then risked their lives in a 300-foot-high fly-over of the Nazca plain. Their balloon was descending rapidly and after they had thrown off more and more sacks of ballast they jumped clear of their craft some ten feet above the *pampas*. Free of the balloonists' weight, the

balloon shot skyward and soared almost out of sight, only to finally crash and drag briefly across the ground.

The Nazca markings are indeed a mystery, although we do know who produced them—von Däniken notwithstanding. Conceding that Nazca pottery is found in association with the lines, von Däniken (1970) writes: "But it is surely oversimplifying things to attribute the geometrically arranged lines to the Nazca culture for that reason alone."

No knowledgeable person does. The striking similarity of the stylized figures to those of known Nazca art has been clearly demonstrated (Isbell 1978; 1980). In addition to this iconographic evidence must be added that from carbon-14 analysis: Wooden stakes mark the termination of some of the long lines and one of these was dated to A.D. 525 (±80). This is consistent with the presence of the Nazca Indians who flourished in the area from 200 B.C. to about A.D. 600. Their graves and the ruins of their settlements lie near the drawings.

The questions of who and when aside, the mystery of *why* the markings were made remains, although several hypotheses have been proffered. One is that they represent some form of offerings to the Indian gods (McIntyre 1975). Another is that they form a giant astronomical calendar or "star chart." Writing in *Scientific American,* William H. Isbell (1978) states:

> As Reiche has pointed out for many years, certain of the Pampa Colorada lines mark the position of the sun at the summer and winter solstices and certain other lines also appear to have calendrical significance. A computerized analysis of line orientation conducted by Hawkins, although it failed to demonstrate that a majority of the lines have astronomical significance, showed that twice as many of them were oriented with respect to annual solar and lunar extremes than would be expected on the basis of chance.

Isbell himself suggests that an important function of the markings was economic and "related to the drafting of community labor for public works," although at best that is only a partial explanation.

Still another suggestion (first mentioned by Kosok) comes from art historian Alan Sawyer (McIntyre 1975): "Most figures are composed of a single line that never crosses itself, perhaps the path of a ritual maze. If so, when the Nazcas walked the line, they could have felt they were absorbing the essence of whatever the drawing symbolized." Sawyer is correct in observing that most of the figures are drawn with a continuous, uninterrupted line. But there *are* exceptions, and it is possible that the continuous-line technique is related to the method of producing the figures, as we shall discuss presently.

In any case, these are only some of the hypotheses; whatever meaning(s) we ascribe to the Nazca lines and drawings must be considered in light of other giant ground-markings elsewhere. Even putting aside the

Japanese and European ones—e.g., the White Horse of Uffington, England, which is known from as early as the twelfth century (Welfare and Fairley 1980)—we are left with numerous ground drawings in both North and South America.

In South America giant effigies are found in other locales in Peru, for example, and in Chile, in the Atacama Desert (Welfare and Fairley 1980). Interestingly, the plan of the Incan city of Cuzco was laid out in the shape of a puma, and its inhabitants were known as "members of the body of the puma" (Isbell 1978; 1980).

Turning to North America, there is the Great Serpent Mound in Ohio and giant effigies in the American Southwest. In 1978, with the aid of an Indian guide, I was able to view the ground drawings near Blythe, California, in the Mojave Desert. Like the Nazca figures, the Blythe effigies are large and give the impression they were meant to be viewed from the air. Also in common with the Nazca figures, they were formed by clearing away the surface gravel to expose the lighter-colored soil. However, although they are thought to date from a much later period (Setzler 1952), none of the Blythe figures match the size of the largest Nazca drawings; and the human figures and horselike creatures are much cruder in form, typically having solid-area bodies and sticklike appendages—quite unlike the continuous-line drawings of Nazca (yet somewhat similar to some of the Chilean effigies). Moreover, absent from the Blythe site are the "ruler-straight" lines that may or may not have calendrical significance.

In short, there are similarities and dissimilarities between the Nazca and other ground drawings that complicate our attempts to explain them. Certainly the Blythe and other effigies have no attendant von Dänikenesque "runways"; neither do their crude forms suggest they were drawn with the aid of hovering spacecraft. And there is nothing whatever to warrant the assumption that they were made to be viewed by select native balloonists on aerial sorties.

It seemed to me that a study of *how* the lines were planned and executed might shed some light on the ancient riddle. English explorer and film-maker Tony Morrison has demonstrated that, by using a series of ranging poles, straight lines could be constructed over many miles (Welfare and Fairley 1980). (The long lines "veer from a straight line by only a few yards every mile," reports *Time* [1974].) In fact, along some lines, the remains of posts have been found at roughly one-mile intervals (McIntyre 1975).

By far the most work on the problem of Nazca engineering methods has been done by Maria Reiche (1976). She explains that Nazca artists prepared preliminary drawings on small six-foot-square plots. These plots are still visible near many of the larger figures. The preliminary drawing was then broken down into its component parts for enlargement. Straight lines, she observed, could be made by stretching a rope between two stakes.

Circles could easily be scribed by means of a rope anchored to a rock or stake, and more complex curves could be drawn by linking appropriate arcs. As proof, she reports that there are indeed stones or holes at points that are centers for arcs.

But Reiche does not detail the specific means for positioning the stakes that apparently served as the centers for arcs or the end points of straight lines. In her book she wrote, "Ancient Peruvians must have had instruments and equipment which we ignore and which together with ancient knowledge were buried and hidden from the eyes of the conquerors as the one treasure which was not to be surrendered." Be that as it may, Isbell (1978) states: "Maria Reiche, using scale models, has made major advances toward demonstrating how Nazca ground art was produced. Although more research needs to be done, the prehistoric engineering skills are no longer completely unknown."

Isbell himself suggests that the Nazcas used a grid system adapted from their weaving experience, a loom "establishing a natural grid within which a figure is placed." All that would be necessary, he observes, would be to simply enlarge the grid to produce the large drawings.

However, as one who has used the grid system countless times (in reproducing large trademarks and pictorials on billboards—summer work during my high school and college years), I am convinced the grid system was not employed. To mention only one reason, a characteristic of the grid method is that errors or distortions are largely confined to individual squares. Thus, the "condor" drawing in Figure 1—with its askew wings, mismatched feet, and other asymmetrical features—seems not to have been reproduced by means of a grid.

Other, even less likely possibilities would be the plotting of points by a traverse surveying technique (such as is used today to plot a boundary of land) or by triangulation. Having some experience with both of these, I note that such methods depend on the accurate measurement of angles, and there appears to be no evidence that the Nazcas had such a capability.

I decided to attempt to reproduce one of the larger Nazca figures—the 440-foot-long condor in the center of Figure 1—using a means I thought the Nazcas might actually have employed. I was joined in the project by two of my cousins, John May and Sid Haney. The method we chose was quite simple: We would establish a center line and locate points on the drawing by plotting their coordinates. That is, on the small drawing we would measure along the center line from one end (the bird's beak) to a point on the line directly opposite the point to be plotted (say a wing tip). Then we would measure the distance from the center line to the desired point. A given number of units on the small drawing would require the same number of units—larger units—on the large drawing.

For this larger unit we used one gleaned by Maria Reiche from her study of the Nazca drawings and approximately equivalent to 12.68 inches. For measuring on the ground, we prepared ropes marked off with paint

into these Nazca "feet," with a knot tied at each ten-"foot" interval for a total length of 100 units. To aid in accuracy in plotting on the ground, we decided to employ a "T" made of two slender strips of wood. With this we could ensure that each measurement made from the center line would be at approximate right-angles to the line.

My father, J. Wendell Nickell, took charge of logistics—including obtaining permission to use a suitable giant "drawing board" (a landfill area in West Liberty, Kentucky, owned by Dr. C. C. Smith, to whom we are grateful) and securing the services of a pilot for the subsequent aerial photography. Since we could not mark the lines by clearing gravel to expose lighter-colored earth, as the Nazcas did, we planned to simply mark them with white lime, as one marks a playing field. With the addition of my young cousin, Jim Mathis, and my 11-year-old nephew, Conrad Nickell, our work crew of Indians was complete.

On the morning of August 7, 1982, the six of us assembled at the site and immediately began by laying out the center line. Some nine hours, one meal, and much ice-water later, we had plotted and staked the last of 165 points and had connected them with twine.

Here, I think, we differed slightly from the Nazcas, for I seriously doubt they expended just over a mile of string (the total distance traversed by the outline). I rather suspect that they made their furrows (or at least preliminary scratched lines) as they progressed in plotting the various points. We could not do this, since rain threatened and would certainly obliterate our lines of powdered lime. But we did find it helpful (though not essential) to connect our points in sequence, to prevent possible confusion with stakes sometimes clustered rather closely together. (Otherwise we would have needed only a single long length of cord, to be used for the final marking of each straight line.)

The rains did come, and while no harm was done to our staked-out condor, large puddles (then more rain and still more puddles) prevented our completing our project for about a week. Finally, the ground had dried, the weather forecast was good, and the pilot was on standby. My father and I then spent much of one day marking the lines, finishing just in time to see the airplane circling.

Jerry Mays, a skilled local pilot, then took John and me up in his Cessna for a preliminary look and the taking of photographs, which John accomplished at just under 1,000 feet.

As Figure 2 shows, our work was a success. In fact the results were so accurate that we are convinced we could have easily produced a more symmetrical figure by this method. Thus it would seem—unless they employed an even simpler method of making the enlargement—that the Nazcas plotted considerably fewer points. That, coupled with mere visual estimation of right angles and less careful measurement (distances might simply be stepped off), could account for the imperfections we observed. Also, an entire small area, such as a foot, could have been done completely

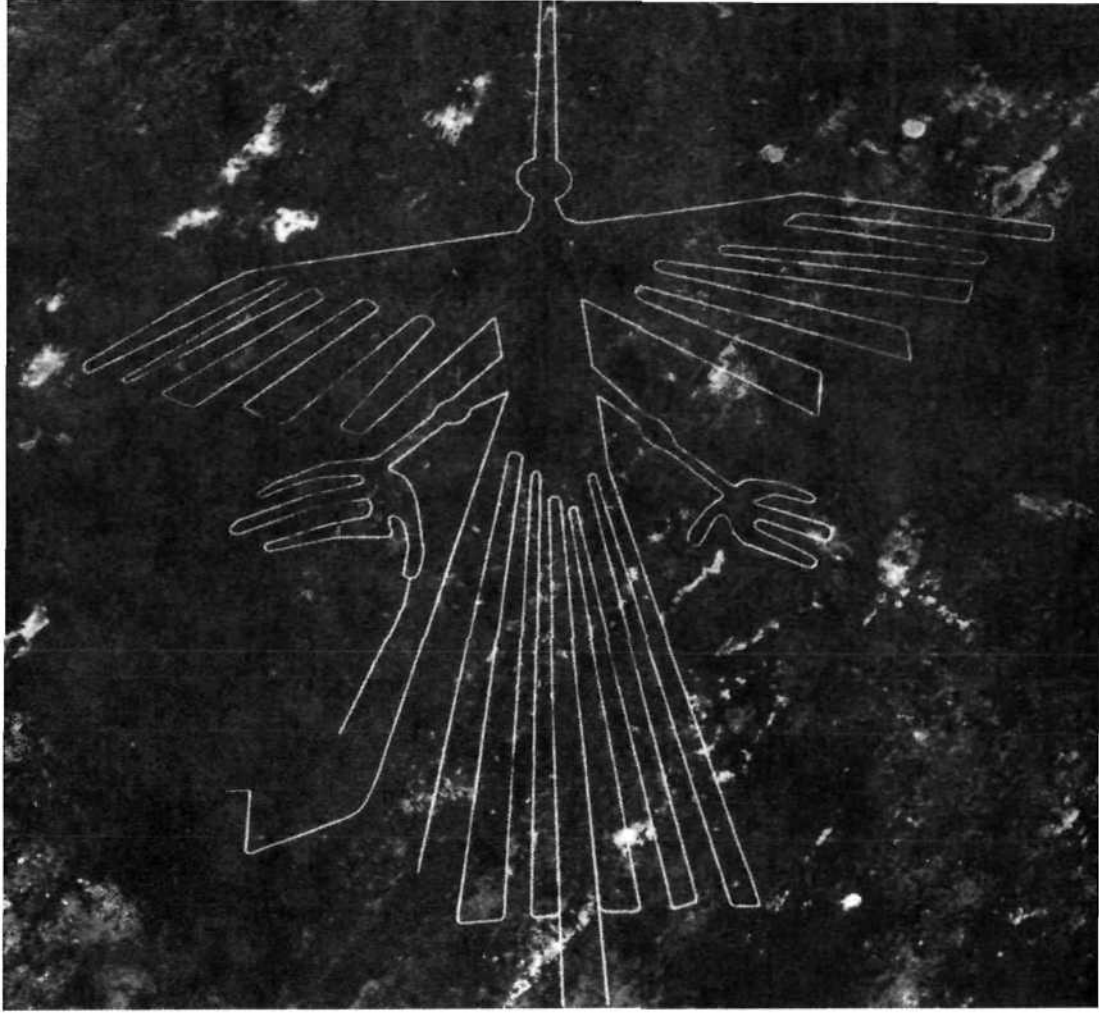

FIGURE 2. A duplication of the giant "condor" drawing made full size and utilizing only sticks and cord such as the Nazcas might have employed. The experimental drawing—possibly the world's largest art reproduction—is viewed here from just under 1,000 feet.

freehand. (Our own freehand work was minimal: We produced the circle of the head by scribing it with a rope. All other curves were *marked* freehand; of course we *had* plotted the numerous points that served as a guide, although we bypassed stakes slightly in attempting to draw smooth curves.)

It is frequently asserted that the Nazca drawings are recognizable only from the air. That is not quite true, certainly not of the smaller figures, such as the effigy of a fish, which is only 80 feet long (Reiche 1976). Neither is it true of some drawings—attributed to the Nazcas' predecessors—that are found on hill slopes (McIntyre 1975; Isbell 1978, 1980). Here, seemingly, is a clue to how the Nazcas could have been confident of the accuracy of their method of enlargement. Once a technique was found to be successful for

producing large drawings on slopes, where they could actually be viewed from the ground, the same technique could be expected to consistently yield good results—wherever figures were drawn and whatever their size.

Moreover, even the large drawings can be appreciated to some extent from the ground. With our condor, we were able to see whole portions—such as body and head, leg and foot, the entire fan of the tail—and thus had determined the figure was reasonably accurate even before our fly-over. We felt that an observer would be able to recognize it as a bird.

To test this possibility, my father took wildlife biologist Harold Barber to the site. Although Barber knew nothing of our project, and Nazca was deliberately not mentioned, on viewing the figure he recognized the drawing as one of the Nazca birds. That he was familiar with the Nazca ground drawings was unfortunate for our experiment (and rain prevented another); but the salient point is that he was able to identify the figure as a bird rather than as a spider, fish, monkey, or some other figure. In fact, when he was later shown pictures of several Nazca bird drawings, he immediately and correctly identified ours as the condor.

In summary, we do know that it was the Nazcas who produced the drawings. While their large size does suggest the possibility that they were meant to be viewed from above, as by the Indian gods, the figures can be recognized, at least to some extent, from the ground. The drawings could have been produced by a simple method requiring only materials available to South American Indians centuries ago. The Nazcas probably used a simplified form of this method, with perhaps a significant amount of the work being done freehand. There is no evidence that extraterrestrials were involved; but, if they were, one can only conclude that they seem to have used sticks and cord just as the Indians did.

Acknowledgments

In addition to those mentioned in the text, the author also wishes to thank his mother, Ella T. Nickell; Robert H. van Outer and the University of Kentucky Photographic Services; Carl Burton; and the May Grocery Co. and the Blair Wholesale Grocery Co., both of West Liberty, Kentucky.

References

Discover. 1982. "Riddles in the Sand" (June): 50-57.

Isbell, William H. 1978. "The Prehistoric Ground Drawings of Peru." *Scientific American* 239 (October): 140-53.

_____. 1980. "Solving the Mystery of Nazca." *Fate* (October): 36-48.

Kosok, Paul. 1947. "The Markings of Nazca" (written in collaboration with Maria Reiche). *Natural History* 56: 200-38.

McIntyre, Loren. 1975. "Mystery of the Ancient Nazca Lines." *National Geographic* (May): 716-28.

Reiche, Maria. 1976. *Mystery on the Desert* (1968), rev. ed. Stuttgart: Privately

printed.
Setzler, Frank M. 1952. "Seeking the Secrets of the Giants." *National Geographic* 102: 393-404.
Time. 1974. "Mystery on the Mesa" (March 25).
Von Däniken, Erich. 1970. *Chariots of the Gods?* New York: G. P. Putnam.
_____. 1972. *Gods from Outer Space*. New York: Bantam Books.
Welfare, Simon, and Fairley, John. 1980. *Arthur C. Clarke's Mysterious World*. New York: A & W Publishers.
Woodman, Jim. 1977. *Nazca: Journey to the Sun*. New York: Pocket Books. ●