Maize Diffused to India before Columbus Came to America

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INTRODUCTION

Social scientists have been struggling to understand better how the high civilizations arose around the earth in the pre-AD 1500 period, prior to the expansion of the European colonial powers. Many studies of technologies, religions, linguistics, etc., indicate that these developmental processes of civilizations were spread by exchanges across the oceans a millenium ago. Frequently, traditional and conservative researchers have demanded extremely high levels of substantiation for exchanges whose verification would threaten the prevailing belief that no significant contact across the oceans had occurred. Before evidence became available suggesting that dispersal of high cultures took place across the ocean 'highways', the traditionalists claimed that the homologous traits could have been developed independently. Therefore, it became necessary to conduct an active search for a trait, such as domesticated maize or some other crop, that could not be invented autochthonously twice.

HISTORICAL PERSPECTIVE

In the broad perspective, this research was initiated because of Stonor and Anderson's 1949 findings that the presence of maize varieties and cultural factors indicated considerable age of maize in Assam and adjacent India. Following up on this, Anderson's good friend Carl Sauer (1960) found evidence of maize in southern Europe prior to 1492. Others such as Carter (1963, 1974, 1988), Heyerdahl (1979, 1986), Jeffreys (1953, 1965, 1967, 1971, 1975), and Marszewski (1978, 1987) found data which indicated to them that maize was in Asia prior to Columbus' voyage. Against this background, when Hürlimann (1967) and Jett (1978) produced pictures of statues of maidens holding maize-like objects, in temples of south India, there seemed ample reason to start research on maize in the Mysore-Bangalore area of south India. This beginning of the study of maize in India was reinforced by over sixty photocopied pictures sent to me by Professor Donald B. Lawrence who, with his group, had photographed at three of these temples. Other photos of the temples were received from Dr. Jaweed Ashraf, who obtained his photos from the Photographic Library of the Archaeological Survey of India in New Dehli.

DATA GATHERING

A decade of research and seven trips to Karnataka State for the study of Hoysala Dynasty Temples in the region, have provided ample evidence (which includes crops) to support the thesis that there was early communication between the Americas and south Asia. Most of these Hoysala temples are dated to the 11th to 13th centuries AD (Narasimhachar 1977; Doshi 1981). Several papers relate to these data (Johannessen 1988, 1992; Johannessen and Parker 1989). In the process of this study I have been able to discover over thirty-five anatomical traits that indicate maize ears of considerable variety had to have been the models for the sculpted ears in the religious statuary in India. Every sculpted ear is distinctive. The ears are not copies of one another. No other plant has this much variability in its fruiting body. All of these anatomical features are found in both ancient and modern maize ears.

TRAITS INDICATING MAIZE

These traits that were sculpted during the 11th to the 13th century AD are homologous with real maize ears and are shown in the figures which follow:

Size and Shape of Ear

1. The relationship of size and shape of many sculptured maize ears to the anatomy of the sculptured human statues holding the maize ears appears subjectively to be inclusive of the range of real maize ears in relation to real human forms.

2. Sides of ears are: a) parallel; b) bulging at midway; or c) bulging at the base.

3. Tips of ears are: a) generally pointed; b) sometimes fasciated; c) occasionally rounded; d) knobbed.

4. Sculpted ears are sometimes warped, as real maize is when picked while still slightly moist and then dried fast. This could happen if they were originally given as offerings of the first-fruits harvest ritual, which is what was likely offered at the temples. However, sometimes maize ears grow in a warped condition when the water and sun relationships have not been optimum or when the 'silks' have exerted unevenly and have not been pollinated equally.

5. Straight ears are normal and indicate that some of the ears of first-fruits harvest offerings were fully mature, had been allowed to dry equally around the ear while still on the stalk, and were, therefore, unwarped.

Ears in Husks

6. Ears are usually shown with husks removed and kernels exposed. This could have happened when persons who grew the maize selected as offerings the most beautiful ears for the home or temple altars.

7. Husks only partly cover the ear in about three percent of the maize sculptures (in addition to that portion of the stone 'left' for sculptural, structural support) and therefore leave rows of kernels exposed.

8. Husks on the ears are relatively rare; still, some ears are entirely enclosed, and therefore generally have a smooth surface.

9. A smaller number of ears in the husk have a doubly-etched curl, representing 'silk,' from the top of the husk (the curl of which in Guatemala, among Mayan iconography, indicates the signature for the corn god).

10. Ears-in-the-husk in a very few cases have etched curls inside the curls of the silks.

11. Shape of ears in husk is similar to shape of ears that have been offered in a de-husked condition.

Rows and Ranks of Kernels

12. When dehusked, the rows of kernels generally are parallel and extend the full length of the ear. (Individual rows are not truncated as they are seen in basketry nodes where the rows shrink to form the tip of a cornucopia.)

13. Occasionally, rows of kernels are found also to be entirely jumbled in a condition called 'tessellate.'

14. Ears can be found that have parallel rows over the top two-thirds of the ear and also have: a) tessellate arrangement of kernels at the base; or b) the tessellate condition only at the small end of the ear; or c) the tessellate condition only on the front and bottom of the ear with the side rows of the same ear parallel.

15. Rows may be parallel on the basal three-quarters of the ears, and, in the upper one-fourth of the ear's length, the kernels in the row spiral around the tip end.

16. Rows are found that spiral gently towards the tip from the base.

17. Sometimes, where sculpturing was incomplete, sketches are found on the ears. In such cases, a) rectilinear scratches or grooves have been carved on the front of an ear with husks partly removed; or b) the ears may show normal kernels down the center rows of the ear, but only longitudinal grooves and ridges cut parallel to the rows with kernels. The maize kernels had not been carved individually into the bare continuous ridges at the time the sculpture was taken to be placed in the new temple walls. But the presence of ridges indicates by width and shape that they were designed to be carved upon to make kernels. Apparently, statues were not carved or touched up once they were installed in the temple wall. Other evidence in the form of the details in the shapes of large blocks in the temple walls and foundations also similarly indicate there was probably an early prohibition against carving at the temple site once blocks were in place.

18. The compound female flower of maize is its ear, and on the cob the kernels develop as pairs of florets, each pair being in a single cupule. Normally, these cupules are stacked on top of each other to form rows of paired kernels called ranks. In both real and sculpted maize in India we find that: a) the pairs of kernels in a rank are at times exactly opposite the adjacent pair; but b) regularly they can also be offset by one-half a kernel's thickness up and down the cob; or c) individual cupules may be tilted on the cob with each kernel of each pair displaced half a thickness up or down the cob [creating near-tessellate conditions]; and d) the kernels' arrangements, relative to kernels at their sides, may change at various locations on the cob.

We find all of this variability on the sculptured maize ears. Although the 'textbook' pattern of displacements allows a nesting effect between ranks for closer packing of kernels, shifts in this sequence occur often too. Without the stimulus of a real maize ear as a model, it would be difficult to sculpt in this detail, and no sculptor could develop all these maize-specific details. Maize is idiosyncratic in this regard; no other grain has this feature nor most of the other traits detailed here either.

19. Knobs (of kernels and cob) at the end of the ear may occasionally represent a deformity caused by either lack of pollination, larval destruction of a part of the cob near the tip while it was immature, or some other unrecognized growth factor in the ear which is related to the availability of water in the soil.

Kernel Characteristics

20. Sculpted kernels are, on average, rounded rectilinear in shape, though they are somewhat more squared than is typical of modern maize. Archaeological maize kernels of a thousand years ago in America also show this Hoysala characteristic of smaller width to thickness (w/t) ratios, *i.e.,* about 1.0 to 1.5, though the range of shapes of modern maize spreads over a broader spectrum of w/t ratios, *i.e.,* from 1.0 to 2.3.

21. Kernels are often carved a) smaller at the tip of the ears; and b) sometimes rounder at the tip.

22. At least once, the upper 1/6 of kernels are tiny at the tip of the ear as though they were totally unpollinated.

23. Rows of mature kernels are parallel to rows of unpollinated kernels with partial husks on the sides. An artificial 'object' made by a person and copied into the stone would hardly have been arranged in this way.

24. A few kernels with dent characteristic are found in ears with otherwise flint or flour type of rounded-topped kernels.

25. 'Dog tooth' kernels, etched on an otherwise smooth, 'blank' ear, are similar to highland corn in the Americas.

Table I ANATOMICAL VARIATIONS OF MAIZE SHOWN IN PHOTOGRAPHS — Figures 1 through 20 *ff*

TRAIT	FIGURE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2a	X	X	X	X		X		X		X				X	X	X	X	X		X
2b							X		X		X	X	X						X	
3a	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X
3b							X													
3c		X	X								X									
4	X				X			X				X	X					X	X	X
5		X	X	X			X	X	X	X	X			X	X	X	X			
6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
7																X				
8																	X			
10																				X
11																X	X			X
12	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
14a											X									
14b														X						
14c											X									
16																		X	X	
18a	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	
18b	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	
18c		X	X	X	X	X	X	X	X	X	X		X	X					X	
18d	X	X		X	X	X	X	X	X	X	X	X				X		X	X	
19					X			X	X			X								
20	1.1	1.1-1.2	1.3-1.6	1.1	1.1-1.2	1.0-1.5	1.2	1.1	1.0	1.2	1.1	1.2-1.4	1.3			1.1		1.3	1.0	
21a	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	
21b	X	X				X		X			X					X			X	
23																X				
26													X							
27													X							
28																			X	

Traits discussed in the text but not illustrated in the photographs do not appear in the table.

26. 'Dog tooth' kernels at other temples are carved in the round with a point at the tip of the kernels on a few ears instead of the normal rounded-end. These shapes are found in certain flint-type kernels in locations such as high-elevation Mesoamerica and Peru.

27. Kernels which are imbricated (or overlapping) at the tip are also found in these same high-elevation areas.

28. Some very enlarged kernels are present, somewhat like 'Cuzco' variety maize from Peru. When this occurs, often the kernels are round and may not fit the modern Cuzco variety-type perfectly.

Color

29. Both Lakshmi, goddess of wealth and fertility, and Vishnu, god who protects earth, and even Kubera, earlier the god of wealth, had to be worshipped with golden objects. We obviously cannot tell from the sculptures what the color of maize was. However, we generally know that yellow maize is frequently golden in color; therefore, maize could have seemed an especially appropriate gift of gold for the gods when maize was viewed originally by Hindus. Perhaps they saw it as a sun symbol as well. The other colors of maize kernels—red, black, white, and yellow—would aid the Hindus' worship of the several compass directions, as well as the specific dates and numbered days of their calendric system. The Amerind, especially Mayan and Incan, have also used color in a similar manner to label directions.

PLATE I

Figure 1 HALEBID: Offset paired kernels

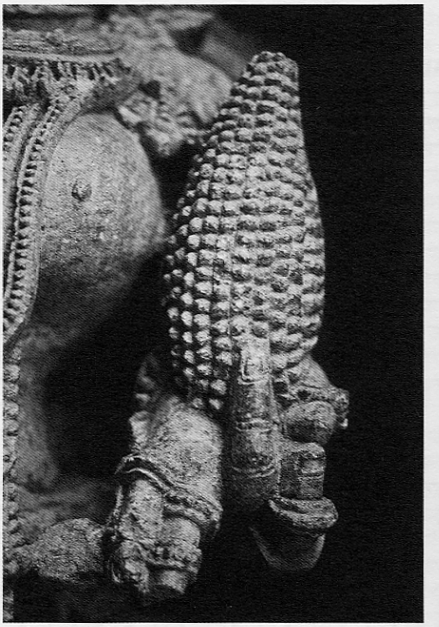


Figure 2 SOMNATHPUR: Large straight ear

Figure 3 SOMNATHPUR: Conical ear

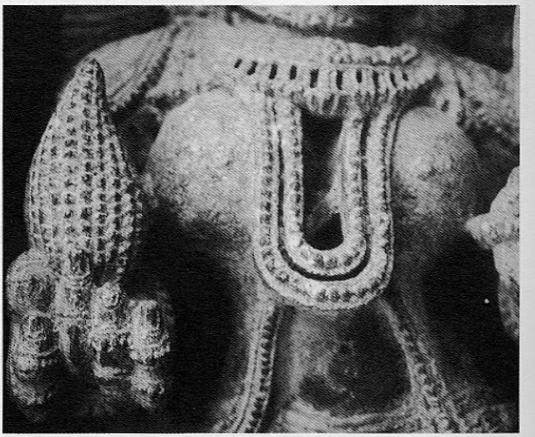


Figure 4 SOMNATHPUR: Rows of paired offset kernels

PLATE II

Figures 5 and 6 SOMNATHPUR: Curving conical ear and elongate ear

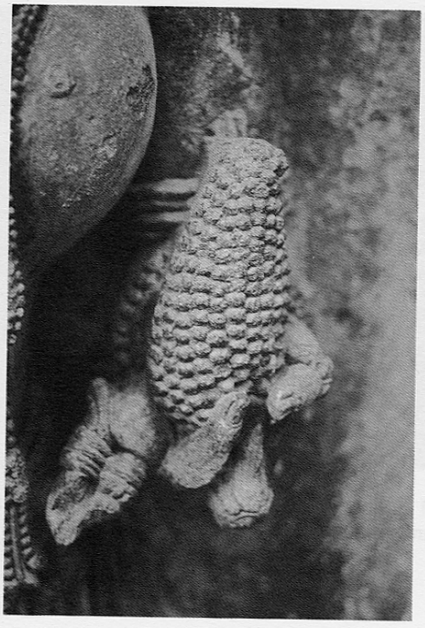
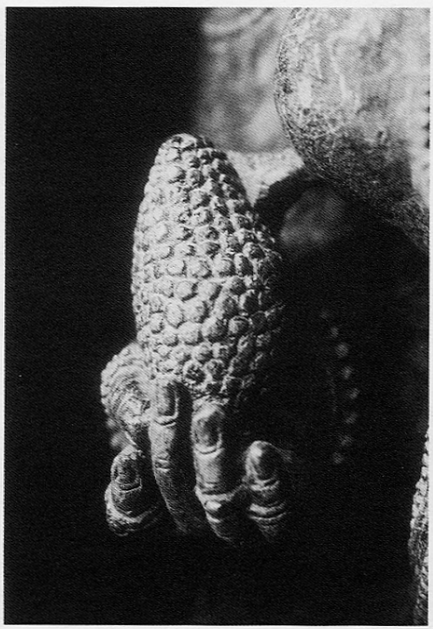


Figure 7 BELUR: Fasciated tip of ear
(Figure 8, page 109)

Figure 9 HALEBID: Knobbed tip of ear

PLATE III



Figures 10 and 11 SOMNATHPUR: Left, offset paired kernels; Right, tessellate basal rows in front, parallel rows on side

Figure 12 BELUR: Conical ear

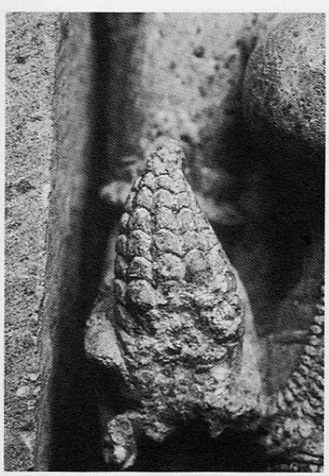


Figure 13 SOMNATHPUR

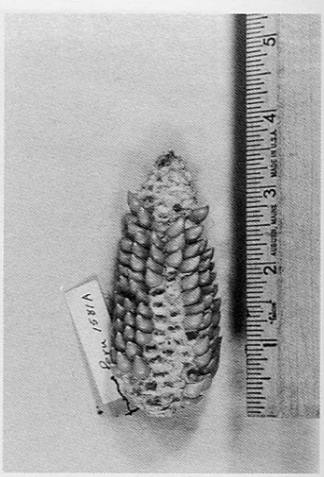


Figure 13a WISCONSIN HERBARIUM

Compare 'dog tooth' kernels on a sculpted conical ear at left with pointed kernels on a maize ear at right.

PLATE IV

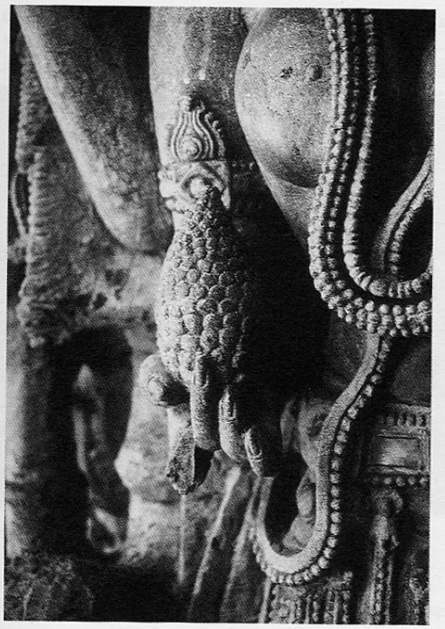


Figure 14 HALEBID: Tessellate middle, with *mudra*

Figure 15 HALEBID: Tessellate, knobbed, conical

Figure 16 SOMNATHPUR: Unpollinated kernels
Two rows of mature; four immature

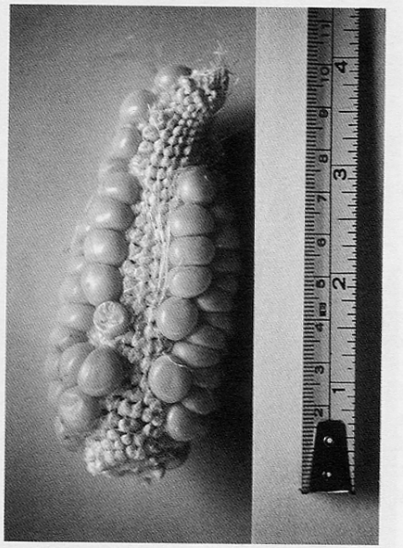


Figure 16a ACTUAL AMERICAN MAIZE EAR
Bent tip, poorly pollinated
Compare with sculpted ear in Figure 16.
(Eugene OR 1995)

PLATE V

Figure 17 HALEBID: Ear in husk with silks pulled

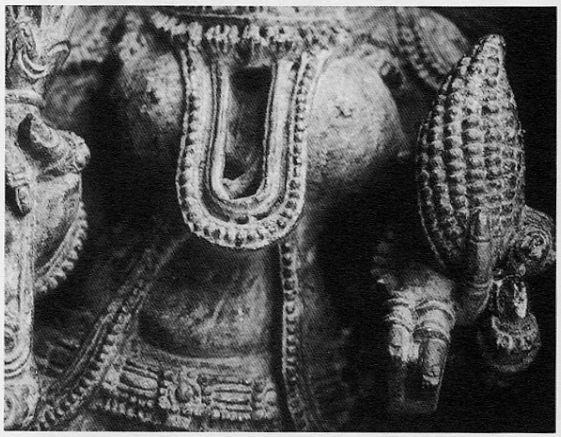


Figure 18 SOMNATHPUR
Rows spiral from base, normal for maize
Note *mudra*.

Figure 19 HALEBID: Rows spiral from base

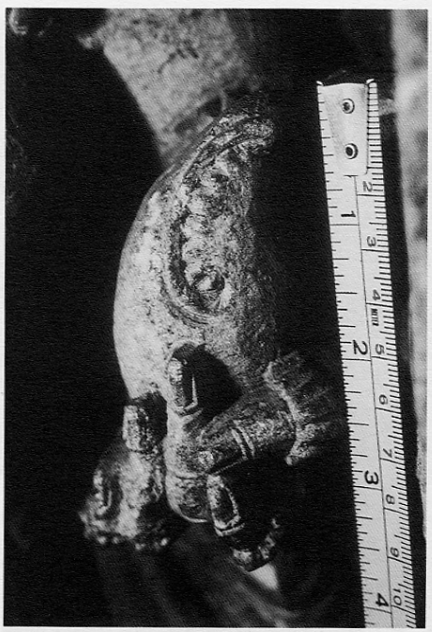


Figure 20 JAVAGAL TEMPLE
Ear in husk with curls of silk

Alternative to Maize

No other crop plant, or fruiting body, on any farm or at any market has this much all-inclusive variability and yet remains within the constraint of shapes that are correlated with maize ears. It is unlikely that, without an abundance of offertory maize ears grown by the community of religious farmers, the temple sculptors would have produced this much variability of artistic creativity at random. Perhaps the maize ear was imported as a simple trade good for religious purposes; this interpretation is unlikely, though a possibility. No other human-created objects have this much innate diversity.

Cornucopia

The horn-of-plenty made of basketry, does not correspond to the observed distributions of lumps—kernels in my analysis—nor would it be functional in the observed context due to the fact that the small end of these objects is up. If the object were a cornucopia, all its contents would spill out. In other Indian sculpture, the narrow, pointed end of cornucopia normally points down (Bussagli and Sivaramamurti 1971).

Purse

Purses decorated with stitched-on pearls or cowrie shells, as suggested by certain scholars, are also very unlikely models for these objects. Had such purses existed in the abundance suggested by the sculpted objects, surely some remains would have been found. Yet the Archaeological Survey of India has found no caches of pearls in any archaeological deposits.

Pomegranates

Pomegranates cannot have been the stimulus for these maize-like carvings held by an 8th century Kubera, as one Hindu scholar (Mundkur 1980) has suggested. The sculpted forms are neither round, nor do they have the calyx tips of the floral remnant of the pomegranate at the top. They are not carved in the way pomegranates are carved in other temple statuary found in northern India. Furthermore, if these sculptures were intended to represent pomegranates, they would have had to be *peeled* pomegranates, showing the juicy seeds and the blank spaces of the placenta as a pomegranate does when the outer skin has been removed. The Hindu priests would not have wanted someone else to peel the fruit and offer it in this perishable condition at the temple. It does seem likely that the pomegranate with its multi-seeded, red, round fruit may have been carved with its calyx protruding upward in a form reminiscent of a cross-section of the female symbol in the Siva temples.

The sculptured maize ear with its yellow-gold to white seeds and phallic shape, when used in a temple to Lord Siva, is most likely a multi-seeded symbol as is indicated by the traditional hand *mudra* of the attendants and goddesses holding the ears.

Objections and Support for the Maize Hypothesis

Maxwell's Objections

The anthropologist T. J. Maxwell (1979) has attempted to discredit the kind of investigation carried out here. In 1979 he had only the writings of Hürlimann (1967), Jett (1978), and Carter (1979b) that earlier had suggested the verity (but without the detail) of the maize represented at Halebid. Even though Maxwell acknowledges that he found no other fruit that really matched the objects held in the hands of the goddesses, he postulated the noni fruit (*Morinda citrofolia*) as a possible model. "Carved in stone it would look very much like an ear of corn." Nevertheless, he also says, "The noni looks nothing at all like maize in the flesh . . . ." It is strange what some are willing to do to support their previously held views.

Maxwell uses photographs in Coomaraswamy's (1927 [1965]) *History of India* as a source of the symbolism for lumpy objects that might have been used as the models for the maize-like objects or carvings. He postulates the following imagery of their origin: Buddha's hair curls, fluted stone stupas, coiled snakes and cobras, piles of balls, or heaps of gems. One can only assume that he never tried to pile balls on top of each other. Despite the impossibility of these explanations, Maxwell concludes that he has destroyed the interpretation of these objects as having been modeled from maize-like objects.

In an answer, Carter (1979b) points out that Maxwell did not make an effective case against maize, and I would certainly agree. In addition, Carter emphasizes that a multitude of potentially diffused cultural traits provides a matrix in which the other evidence of the presence of maize, such as the maize pollen discoveries, demonstrates that it is highly likely that diffusion across the oceans took place a long time ago.

The pollen studies appear to be too confounding for me to address here, because, apparently, the most important archaeological maize pollen that had been discovered was inadvertently discarded from Vishnu-Mittre's (1966) former laboratory when, on his retirement, the laboratory was cleaned of all its contents by a custodian. Vishnu-Mittre had been pressured to doubt the correctness of his former analysis of maize pollen from an early date.

Another reason for Carter's (1979b) rejection of Maxwell's article, referred to above, was a potsherd discovered by Vishnu-Mittre (1966) with what both men interpreted as possible maize kernel impressions on the curved pottery surface; but that bit of evidence for maize is in the process of being refuted (Johannessen 1989b).

Modern Replacement of Statuary

Some reviewers of the ideas about maize in India, such as Maxwell (1979), have suggested that the temples with the maize-like objects were simply the result of the replacement of AD 1529 temple carvings by more recent

statues and friezes of women holding maize images that were thought to have been introduced by the Portuguese in the previous *three decades*. Maxwell's and others' inferences can hardly be valid because:

1. By this reasoning, the hypothetical carvers would have had to obtain, for the many models of maize, the ancient types of American maize, not the larger, later types available in the Americas in the 1490s.

2. The statuaries in the more than thirty-five temples I visited all have similar patina on their surfaces, the result of long exposure to weathering.

3. Statuary from temples that were destroyed or broken down and partly buried long before the Portuguese arrived have recently been unearthed, and these figures have the same maize representations. Moreover, these ruin excavations, carried out (*e.g.,* Halebid) over the last decade, are in the same general settings as five other temples, apparently of Hoysala Dynasty age.

4. Many of the sculpted maize ears have ancient 'pyramidal,' or conical, shape that are unlikely to have been available to serve as models in recent times.

5. Many of their kernels are frequently more roundish or squarish in plan outline than are the rounded-rectangular kernels that are normal for AD 1500 and the present. The old types of maize ears do still exist. It is unlikely that more recent sculptors, just to obfuscate modern scholars, could have recognized these more ancient shapes, which are largely absent in most modern maize near the temples.

6. As many as eighty ears of large size and several hundred smaller ones can occur in a single temple. At least eighty-two Hoysala temples are listed by the Archaeological Survey of India and many more are recognized. Each temple that I have visited has many sculptured ears of maize and often other American crop-plant representations as well. Maxwell (1979) apparently knew of only one temple at Halebid that had such carvings, yet there are at least five temples at that site alone, all with maize representations.

7. The sculptors of the original figures are identified by their signatures on these sculptures. The Indian archaeological community has compiled a history of the works of these master sculptors (Padmanabha 1989).

8. Since the Indians also value their antiquities and have limited economic resources, how can it be postulated that someone did all these carvings differently from the ancient heritage and did it for free, left no record, and inserted a new crop-plant into religious art of the many sects represented in the temples of the Hoysala Dynasty?

9. Look at the complexity of the statuary. Think about the labor of dismantling these interlocking bas-relief statues from their temple walls with their tons of stone roofs, and then reassembling the structures at eighty locations without leaving a record—just to tease scholars and the scientific community. In fact, even Maxwell (1979) wrote: "I suspect this frieze was not so remodeled."

Scholarly Resistance to New Research

The same arguments as Maxwell's have been advanced by others who were less objective, in communication as reviewers of manuscripts and grant applications, without recognizing that such arguments could not possibly constitute a valid reason for rejecting a grant proposal. Neither did the reviewers demonstrate that they understood the anatomy of the maize ears, but they remain anonymous.

However, the arch anti-diffusionist, E. D. Merrill (1954:373), in the fine print of the postscript to his book on Cook's voyages, accepts the evidence of maize in Europe in pre-Columbian times. Earlier in the same work, Merrill had berated the world-renowned diffusionists for suggesting exchanges across the oceans. He had claimed in the body of his book (already printed at the time he wrote the postscript) that the Portuguese had been the sole carriers of maize and the other crop-plants to Asia after the discovery of America by Columbus, even though he had no real basis in historical records to back it up.

The traditional Hindus do not accept a new crop easily into their religious heritage. Some of the temples have remained continuously active since their construction, according to what I am told. No one in archaeology at the University of Mysore, India, has suggested that the maidens have been tampered with in the way some critics claim. Patel (1990) did his doctoral dissertation on the temple at Somnathpur and found no evidence of this type of alteration, though reconstruction had occurred in places, but then neither did he mention the maize nor discuss what was in the maidens' hands that looked like maize. In the other dozen books on the Hoysala Dynasties, the possibility that these maize-like objects represented maize has been significantly ignored (Anand 1977; Collyer 1990; Foekema 1994; Narasimhachar 1977 [1917], 1919; Padmanabha 1989; Ramaswami 1984; and Settar 1991, 1992). In part, this results from the fact that we humans tend to accept authority figures, and for a long time, at least since the coming of the British, the professionals have been saying that no maize or other evidence of contact between New and Old World existed. Another reason is that not many people with Latin American experience of the high variability of maize have looked closely at the details of these maize carvings.

The climate of the eastern slope of the Western Ghats of Karnataka state produces moderate rainfall, and the stone in the temples has withstood weathering better than the random vandalism by humans. The Indian Government has been quite protective of their temples, but the randomness of the acts and the destruction from stones thrown over the outside walls protecting the temples are very difficult to control except by education stressing the world value of India's sculptural art, that surely matches anything on this scale in the world.

Critics of these data have objected to the dating of the temples. However, the Indians have sequential written records of the last 2,000 years of their history, and to

challenge that record just to try to resist a shift in a scientific 'belief' system is not a productive activity. The data now discovered cause a shift to a new understanding of the history of world civilization. Both New and Old World civilizations are involved, and each influenced the other. The oceans were not a one-way route for culture.

Some scientists require that cobs and pollen be found in India before they will grant even a tentative acceptance of maize in that region. I agree that such discovery would be welcome, and I assume that ultimately ancient maize ears, cobs, and pollen will be found. But we cannot stop work on the problem that maize was being represented just because the archaeologists have not been able thus far to discover this better earth-borne evidence. They will find it. When they do, they can publish it without fear of retribution for further forcing a paradigm shift.

Phytoliths versus Pollen

A first step in the search for real maize in India should be an effort to find maize phytoliths—the little pieces of plant opal, or sand-sized quartz particles, that form in grass and maize leaves. These are likely to be located in the ground near the outer margins of excavated platforms of dated temples. Phytoliths are much more likely than pollen to have been preserved in the dry soil under the margins of these temples. Moreover, such excavation can be carried out with the cooperation of Indian government archaeologists and at no risk to the temples when they are already in the process of excavation for repairs. The temples provide their own dating by epigraphic stelae at the temples and written records.

Pollen, on the other hand, needs anaerobic storage in a reducing (not oxidizing) condition, which occurs in permanently wet clays of ponds and swamps that have remained wet for the last two thousand years. If we were to take pollen samples from bogs, we would also need to be lucky enough to find a source of carbon in the profiles (along with funds for carbon dating) in order to demonstrate the presence of maize.

Botanists versus Art Historians

Is not carving in the round, when excellently done, a better representation of a complex botanical object such as a maize ear than any written description of maize could be in pre-Columbian times? Yet, a few art historians and archaeologists have claimed that these carvings *should* not be interpreted as maize, as has been done by maize botanists and maize breeders. Instead some art critic has interpreted them as simply art objects that must have been created by religious sculptors with some unknown significance from some imaginary model. I am unable to give the critics' names because they were anonymous reviewers and each of the objections raised above has been offered. A reviewer even urged me, one assumes seriously, to soak an ear of corn in ocean water for a year and then test whether it would germinate. In fact, maize in aerated, fresh moisture germinates within five days; moreover, it would take up ocean water and die in even less time. Modern sweet corn seed is relatively delicate.

It is the lack of botanical training that inhibits art critics and historians from seeing the totally idiosyncratic nature of the dozens of maize ear shapes in the carvings. None of the carvings is mass produced and none is 'regular' or 'normal.' In the temple sets of maizes, each is a distinctly different and individual case; they could not have been dreamed up if the sculptor or artist had never seen actual ears of corn. Nothing else like a maize ear exists in the world. No other grass grain, pandanus, or palm fruit has the distribution of kernels on a cob that maize has. If you do not believe, take this set of pictures to the corn breeders at their labs or to the maize-ear curator in an herbarium. By all means test the hypothesis, but use an expert on maize anatomy, not an art historian or a believer in a religious cult of false science.

Paradigm Shift

What does it take to change the paradigm? Who better than botanical experts in classification of maize should judge the veracity of the carvings of maize? Maize experts recognize the diversity of maize anatomy, and they acknowledge that most variations of maize are represented by these carvings, with very few features in the carvings that are not presently found in actual maize ears. Maize is more variable than most other grain or fruit crops for the reason that maize is an outcrossing plant. Its genes continually mix due to the difficulty of controlling pollen blown on the wind. Normally, the wind pollinates the female parts of the maize plant at the tips of the silks, which then allows a nucleus from the pollen to grow down the silk to the developing kernel.

American Indians discovered some techniques (not breeding in the technical sense) which allowed them to maintain selected characters of maize. However, Asians, in general, have not bothered with sophisticated control of wind blown pollen for varietal maintenance because their other grain crops, such as rice, wheat, barley, and foxtail millet, are self-pollinating. Traditionally, they never tried to domesticate significantly outcrossing grains (Johannessen 1982, 1987). Sorghum outcrosses only 10-15 percent of the time.

Since maize was selected for increased length and was maintained genetically by special planting techniques, it developed into the vegetational monster that we find today in the Americas. This part of the process had to have been developed in the Americas before the large maizes could have arrived in India, probably over two millennia ago. This lack of selection and maintenance in India was not disastrously disruptive to maize's subsequent genetics, though at present there are fewer varieties of maize in India than in the Americas.

Much, and perhaps most, basic seed genetics for the modern production of maize in commercial agriculture in India have been imported from North America in the last half century as hybrid seed. Older maize types are nevertheless present.

We need field researchers to check on the varieties grown by the small farmers in the Hill Tribes as we hunt for the ancient kinds of maize. You may have to ask hundreds of people in the farmers' markets to find the very few old folk, especially the oldest women, who still grow a little of it for traditional reasons. This is also true in the Balkans and the Middle East—the old women have the seed banked.

Temple Age

The age of these Hoysala temples is fixed by records carved in stone—built-in documentation (Doshi 1981; Maity 1978; Chopra 1973). New aspects of research will involve mapping the location and age of an early series of sculptures of male Hindu gods that hold maize ears, carved in the 5th to 8th centuries AD (Bussagli 1971:192; Bhattacharya 1974). These are found in west central India and were sculpted three to six centuries before maize began to show up in Hoysala Dynasty sculptures to the south of this earlier Gupta realm. Dispersal of temples with statues holding maize continued to the south, but with the difference that, instead of maize being held primarily by males, most of the later, larger, and more intricate representations of maize are held in the hand of female statues, always with the new, distinctive *mudra,* or hand position. You can note the fertility aspects of this sign for yourself. Surely we have to respect the religious symbolism of maize and of God Siva in this representation. During the later Hoysala Dynasty temple-building, most, but not all, of the males and their corn had been relegated to carvings outside and on top of the roofs.

Summary

We have shown that living maize had to have been used as the model for the sculptured, maize-like objects held in the hands of statues in early temples and in the outer-wall friezes in the Hoysala Dynasty temples. These maize-like objects are of an age that demonstrates subcontinent Indians or their trading associates must have had early sailing contact with the Americas or with seafaring traders such as the Arabs, Phoenicians, Africans, Chinese, or Malaysians who had had the contact. Maize is found to have been growing 5,000 to 7,000 years ago in America, where the ears were selectively elongated into what we can recognize as the maize of one to two thousand years ago.

This fact of sailing contact means that the hundreds of other homologous cultural and technological traits that are found on both sides of the Atlantic and Pacific Oceans are also likely to have been exchanged in this trading and missionizing process of the early sailors. Now we start the real work of deciphering the source regions in the New or Old World cultures for these many features. Which traits are sufficiently different from their 'match' that they probably developed independently in each hemisphere? This is a task for revitalizing the Social Sciences at a time when people in high civilization enjoy the detective processes so immensely. Other cultivated plants, such as sweet potato, lagenaria gourd, peanut, sunflowers, tomato, chili pepper, marigold, pineapple, kapok, yam, jicama or yam bean, moschata squash, grain amaranths, prickle poppy, tobacco, guava, construction bamboo, linted-cotton, and many more, should be seriously challenged with respect to their arrival dates on the other sides of the oceans. Western scientists need to recognize that sailors from the civilizations of the earth's relatively tropical regions were exploring the world before and during Europe's Dark Ages. If the many crops existed on both sides of the oceans in the 15th century AD, abundant sailing and exchanges must have occurred that help explain the many similarities in technologies, religions, and cultural traits of the peoples of the world's high civilizations

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