Asking an archaeologist to discuss language is rather like asking a mole to describe life in the treetops. The earthy materials with which archaeologists deal contain no direct traces of the phenomena that figure so largely in a technical consideration of the nature of language. There are no petrified phonemes and no fossil grammars. The oldest actual relicts of language that archaeologists can put their hands on are no older than the first invention of writing systems some five or six thousand years ago. And yet the intricate physiological basis of language makes it perfectly clear that this human ability has deep roots, roots that may extend as far as, or farther back in time than, the documented beginnings of tool-making some two and a half million years ago.

However, to return to the simile: if the forest has been cut down and all that remains are the roots, then the mole may not be such an inappropriate consultant. So it is with the history of language development. Comparative studies can indicate phylogenetic patterns, while detailed understanding of the structure and physiology of modern human linguistic capabilities can suggest possible successive stages of prehuman development; however, beyond a certain point, historical understanding demands dated evidence for successive developmental stages. This record, if it is to be obtained at all, must be sought from paleontologists and archaeologists. It is probable that the search is not quite as hopeless as it may look at first glance, but it is equally certain that there are no very simple answers.

In my mind there stand out two possible lines of approach to the problem. The first involves scrutiny of the record of developing protohuman material culture systems and consideration of its potential relevance to the problem in hand. Stone artefacts are the best and most persistent long-term markers, but during the last five percent of the time span, we can also deal with more fancy evidence such as burials, ornaments, art, notations, cult objects, structures, and so forth.

The second approach involves taking archaeological evidence which is indicative of the economic behavior and the adaptive patterns of early hominids and then considering the potential effects of varying intensities of information exchange on the functioning of the systems. This second approach should contribute to an understanding of the selection pressures that have moulded the evolution of language abilities. PART I of this paper follows the first approach, and PART II the second.

PART I. THE EVOLUTIONARY IMPLICATION OF THE RECORD OF DEVELOPMENT IN MATERIAL CULTURE*

In recent years our understanding of the early development of human culture has undergone several important changes: the known and measured time span of cultural

*This section incorporates material from an unpublished review that I prepared for presentation in a symposium on Form and Formative in the Symbolic Process, organized by Mary LeCron Foster and Peter Claus, at the 73rd annual meeting of the American Anthropological Association, Mexico City, November 1974.
traces has been extended by potassium argon dating and by new finds in East Africa from a grudging half-million years to at least 2½ or 3 million years. This extension not only stretches the record; it affects our understanding of the evolutionary processes involved. We see now that the early stages of material culture were by our standards incredibly long-lasting and static. This has helped to jolt prehistorians out of the propensity to treat the whole archaeological record as a series of chapters in a conventional history, a narrative of events in which the human nature of the actors is tacitly assumed throughout. The long time scale makes us realize that we are dealing with nonhuman antecedents, rather than with quaint, archaic "early men." We have to grapple with the reconstruction of behavioral patterns that no longer have any living counterparts.

It is artefacts that normally function as the distinctive markers of human or protohuman behavior in the geological record, and the earliest artefacts known at the present time have been found in East Africa at sites such as Olduvai, Omo, and East Rudolf, where they can be geophysically dated to between 1½ and 2½ million years. Ancient as they are, they document definite purposive tool-making activity: the formation of sharp edges by the organized and insightful banging of rocks together. The forms, however, are essentially opportunistic, involving empirical appreciation only of the fact that a suitable blow produces two potentially useful results: a sharp-edged flake of variable form, and a jagged-edged scar on the parent block. Either or both items could be, and seem to have been, used as tools. Modern humans can acquire an appreciation of the possibilities of Oldowan techniques in a few moments, and can produce examples of most of the forms with very little practice indeed. There was a minimum of design and control.

By a million years ago, some stone tool makers were producing objects that impress us as much more refined. They involve more definite design and control. Balanced, symmetrical objects such as a handaxe are much harder to manufacture; they require a stronger sense of purpose, more example and instruction, and more practice. By 100,000 years ago, some stone tool assemblages really begin to look elaborate, even to our technologically conscious eyes, and to learn to make them properly, takes years of practice. By 30,000 or 40,000 years ago, a kaleidoscopic diversity of forms and techniques were being utilized, and changes began to be breathtakingly rapid by the standards of the early periods. Explicit traces of symbolizing and ritual become evident: burials with offerings, personal ornaments, engraved lines, representational painting, and sculpture. By about 30,000 years ago, the archaeological record looked like a segment of ethnography. Presumably most of what happened since then has been the cumulative exploitation of the potential that had previously come into being. Another indication of rising levels of effective adaptability is provided by the expansion of hominid ecological range. Existing evidence suggests that hominids were confined to the tropics and warm, temperate zones until about 500,000-700,000 years ago; that is, for two thirds of the time span of the total record.1,2

The immediate question is: Can we find in the archaeological record elements that will help us understand the genesis of human faculties other than technological ones? Do artefacts offer evidence that can help us discern changing levels of capability with symbols, rules, and codes? I will report on the large-scale features of the archaeological record on the assumption that hominid capacity for conceiving and executing increasingly elaborate material culture designs has been connected with rising capacity for manipulating symbols, naming, and speaking. I hope that this conference will stimulate active discussion of these interrelationships.
If we are to use the complexity of artefacts as an indicator, then we have to ask the technical question: What constitutes elaboration and complexity among artefacts? How is it to be measured? These are questions on which we all have intuitive sense, but I am not aware of much systematic work among either archaeologists or ethnographers. For the present purposes, I propose to use the following variables as yardsticks:

1. The number of distinct artefact classes, each with its own distinguishable set of rules. This has a connected but separate aspect.
2. The degree of latitude; that is, the amount of variation among representatives of a distinct class.
3. The number of operations involved in the production of an artefact. This may lead eventually to another quantum jump.
4. Compound artefacts; for example, stone-tipped spears, harpoons.
5. The extent of nonrandom differentiation in space and time; that is, the division of material culture into regional industries with successive distinct episodes or phases.

Paleolithic prehistorians have hitherto made few explicit attempts to measure these qualities and to plot the trajectory of change through time.

There is one qualifying warning to which attention must be drawn at once: I am trying to deal with hominid capacity for, and capability with, the conception and execution of craft designs. In assessing this, positive features of the record, rather than negative ones, must be interpreted. Few, if any, of the assemblages have ever approached in complexity the limits of capability of their makers. Even the complex material culture of modern times has not presumably reached the extremes of which mankind is capable. Thus, lack of elaboration does not prove lack of capability; however, evidence for a particular level of complexity must reflect at least a minimum level of ability. If we look at ethnographic information on the artefacts of recent nonagricultural peoples, we find great differences in the degree of elaboration as measured in various ways, in spite of the fact that inherent capabilities are not known to differ. This view of the situation leaves me with the tentative model of change through time that is presented in Figure 1.

I would argue that an asymptote in the minimum level was probably reached long ago. This involves such basic tool forms as digging sticks, spears, containers, cutting tools, and chopping tools. The recorded equipment of the Tasmanians seems to have been quite close to this minimum. The maximum attainment of elaboration appears in the record to have gone creeping up through the whole span of prehistory. It was certainly not a linear growth pattern, but whether it was a simple geometric growth curve or one with a series of episodic surges remains to be ascertained.

The diagrams in Figures 2 and 3 provide rough guides to what little data I have been able to put together regarding the growing complexity of material culture through time. Figure 2 presents a tentative timetable for the incorporation of increasing numbers of elements. Simple artefacts such as digging sticks are included on a speculative basis. They are preserved so rarely in the record that the oldest known examples almost certainly provide no real indication of the date when their use began. However, they are such basic agents of the adaptive strategy of tropical hunter-gatherers that I feel quite confident in guessing that their antiquity extends back at least as far as that of stone tools. Containers such as bags and baskets are essential ingredients of human behavioral organization, since without them, recipro-
FIGURE 1. A diagrammatic representation of the trajectory of change in the maximum (upper) and the minimum (lower) levels of complexity in material culture, during the course of human evolution.

FIGURE 2. A time-table showing the oldest known archaeological evidence for a series of important items of equipment. Dotted lines show conjectured time ranges. (See text.)
cal sharing of meat and vegetable foods is difficult, if not impossible. We do not know when they first came into use, but it could be argued that the presence on even the earliest sites of numerous small stone artefacts that were probably not made there, implies the use of at least simple pouches or bundles. Certainly by 1½ million years ago, the volume of artefacts at sites such as those of Upper Bed II Olduvai and of the Upper Member of the Koobi Fora Formation is so great that one feels certain that containers must have been in use. Mary Foster (personal communication) has suggested that appreciation of the properties of containers represents an important and formative step in hominid cognition and symbolizing abilities.

**FIGURE 3** shows a tentative timetable for important conceptual steps in the development of methods of making stone tools.\(^1\)

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**Differentiation**

Stone tools, for all their limitations, constitute the best long-term record of changes in cultural systems that we have, and I think there are interesting features, as yet dimly perceived, that may be relevant to the problem in hand. One of these is a rise through time in the degree of differentiation shown by the most elaborate industry of any given period. Two factors are involved in the phenomenon as I perceive it: 1) The degree to which there were distinct target forms in the minds of the
craftsmen, as determined by cultural experience and neurophysiological capacity for design conception: a mental template; and 2) the degree to which the craftsman can control his productions so that an orderly series of replicating forms results.

The two combine to make up what can be termed a "rule system"; that is, an empirical code governing artefact form. In practice, of course, archaeologists study samples of artefacts and must try to recognize from them replicating patterns and hence infer the tool-making habits, rules, and targets of an extinct population.

**Figure 4.** A diagrammatic representation illustrating increasing degrees of stone-artefact elaboration and differentiation. The number of topographic humps denotes the number of distinguishable modalities; the height and pointedness of the peaks denote the degree of standardization within the modality. The recent Australian Data (Ngatjadja) is based on the account of Gould et al.\(^{29}\)

1. eg Oldowan: 1 = core-choppers, 2 = casual scrapers; II. eg Acheulian (Olorgesailie): 2a = scrapers, 2b = nosed scrapers, 2c = large scrapers, 3 = handaxes, 4 = cleavers, 5 = picks, 6 = discoids; III. eg Mousterian: 2a = racloir, 2b = grattoir, 2c = r. convergent, 3 = percoir, 4 = point, 5 = burin, 6 = biface; IV. Upper Paleolithic: 2a = grattoir, 2b = nosed scraper, 2c = raclette, etc., 3 = percoir, 4 = point, 5 = burins, 6 = backed blades, etc.

Ngatjarra: 1a = hafted adzes (purpunpa), 1b = scrapers (purpunpa), 2 = bec. (pitjuru pitjuru).

Differentiation, as I am using the word, is not the same as diversity. The fragments that are taken from a stone-crusher for use as road metal are diverse, but the wide range of forms are not patterned in a way that can be said to show intentional differentiation. In this respect, early stone artefact assemblages are much more like road metal than are many more recent stone artefact assemblages. **Figure 4** presents a diagrammatic expression of how I imagine increasing differentiation may
have come about through a series of successive phases. At each stage, the maximum intensity of differentiation extended beyond that of previous phases. The convention of the diagram is such that in each frame, a topographic surface is depicted so as to represent the pattern of differentiation. Location on the horizontal surface denotes morphology, whereas the vertical scale denotes relative frequency. Each topographic hump represents what I regard as an intrinsic modality. Pinnacles represent very distinct replicative series; low mounds represent series sharing some features, but showing low overall morphological coherence. Very often these unstandardized forms have the air of opportunistic and casual tools. Properly, the volume of each feature should be scaled in proportion to relative abundance. Ultimately we should seek to map differentiation in some such way as this, but paleolithic archaeologists are as yet only groping toward such a conceptualization.

The earliest industries show only two or three distinguishable modalities, and within each there was little detailed rigor of design, either because the targets were vague or because the execution was imprecise and opportunistic, or both. To state this differently, the early assemblages seem to contain few really distinct artefact classes, and the degree of latitude in design was wide. By the end of the Pleistocene, many stone industries, particularly those outside tropical areas, showed extensive design differentiation and considerable fastidiousness in the execution and replication of particularities. Some industries of intermediate age show convincing intermediate states of differentiation. Notice that the last three frames involve progressively less time differences than the first ones: the process was speeding up dramatically toward the end. Note that the diagram also attempts to express the fact that the total range of forms does not change extensively through time. From the very beginning, there were razor-sharp edges, beveled edges, angular spurs, pointed projections, etc.; however, they occur in anarchic combinations with other variables of object form. In some later industries, particular forms were picked out by custom and were carefully produced as a replicating series. Because the change is not so much in available forms as in the exactitude of the rules governing demand and production, the functional consequences cannot be regarded in a simple-minded fashion. It is not necessarily true that the increase in complexity reflects an increase in the number of tasks performed with stone tools, nor are the fancy tools necessarily more efficient in an engineering sense. This is a point that has seldom been recognized, and I will return to discuss it further.

Another aspect of differentiation is the propensity for all later Pleistocene industries to show marked regional idiosyncrasy, in a manner that one cannot help comparing with language and dialect. As we go back in time, variation among industries becomes less and less clearly patterned in relation to geography. There are problems in the resolving power of available samples, but I think that this aspect of changing cultural systems is real and important. The less internal differentiation there was, the less opportunity there was for arbitrary stylistic divergences. Perhaps the increase in differentiation reflects changing patterns of cultural transmission and increasing specificity of language variants.

Because I have discussed elsewhere the technical problems of measuring increasing intra- and interassemblage differentiation and have given tentative diagrammatic representations of such poor data as we have, I will avoid pursuing these issues here. That more and more exacting designs were imposed on materials is also apparent from the record. First, some 1½ million years ago, we see the definite creation of symmetry, as in handaxes; then, about ½ million years ago, into the repertoire there entered deliberate and highly organized techniques of core preparation, such as the Levallois method, and, later, prismatic blades.
One can see as a culmination of this increase in conceptualization and control, the
preparation of compound forms: stone-tipped spears, hafted scrapers, and borers.
The oldest examples known to me of stone forms showing deliberate modifications
that I think indicate hafting are of late Middle or early Upper Pleistocene date,
perhaps 100,000–200,000 years ago. However, recent peoples of Australia and New
Guinea haft suitable unprepared stone fragments, so the practice may be much older
than the first recognizable traces.

The fitting together of parts may well have important interconnections with
cognition as a whole. At about the same time, pieces such as backed knives that show
deliberate and organized assymmetry were differentiated, although they do not
become very common until later.

**Elaboration and Adaptation**

There is good evidence that a carefree stone knapper can generate a stock of
chopping, slicing, scraping, and piercing edges that are fully adequate to perform all
the basic adaptive functions of a hunter-gatherer. Why, then, the increasing involve­
ment with such qualities as symmetry and balance? Why the concern to produce
series of objects that replicate each other in accordance to what must have been
definite rule systems?

My intuition in this matter is that we see in the stone tools the reflection of
changes that were affecting culture as a whole, and whose functional significance can
only be understood in this light. Probably more and more of all behavior, often but
not always including tool-making behavior, involved complex rule systems. In the
realm of communications, this presumably consisted more and more of elaborate
syntax and extended vocabulary; in the realm of social relations, perhaps increasing
numbers of defined categories, obligations, and prescriptions; in the realm of
subsistence, increasing bodies of communicable know-how. The elaborated systems
as a whole may have conferred adaptive advantages on the practitioners, even when
specific individual components such as fancy tools were not directly adaptive. Thus I
envision that once the capability existed, the elaboration of rules and categories
could, in some societies, simply extend into various realms of material culture,
whether differentiation was functionally important or not. Perhaps there is an
underlying pattern of determinants such as that perceived by Mary Douglas in the
relationships between social configurations, religion, and the elaboration of explicit
ritual.26 Certainly there seems to me to be a tendency to greater elaborations of
Pleistocene rule systems in the cold and temperate zones than in the tropics. Meg
Fritz6 has suggested that this may, in part, relate to social marking under conditions of
stress.

**Stages of Development**

In summary, then, I see in the record a rise in complexity and in capacity for
design rules that comprises a continuum divisible into the following segments.†

**Step 1:** (2$\frac{1}{2}$-1$\frac{1}{2}$ Million Years ago). Simple tools, the form of which was
determined by the mechanical properties of natural materials. The imposition of
design was minimal. These tools are core-choppers and flakes, plus spears and

†Steps 1–4 coincide fairly closely with Modes 1–4 as defined by Grahame Clark.14
digging sticks, at a guess. Apes can make and use simple tools, the forms of which are determined more by the material than by the ape. It seems probable to me that the designing and symbolizing capabilities of Plio-Pleistocene hominids was not necessarily vastly beyond that of contemporary pongids.

**Step 2: Middle Pleistocene (1½–.2 Million Years Ago).** Some but not all tools involve the imposition of arbitrary design rules and a new concern with symmetry and regularity—for instance, the handaxe. The repertoire of definite, arbitrary designs was always very small: one or two, to three or four. Technical systems show increasing insight and ingenuity, as in the Levallois preformation method. There was little tendency to systematic, stable, geographic differentiation in material culture rules. I would surmise that containers came into use early in Step 2, if not before. This must be seen as the main formative phase for the more elaborate faculties of mankind. During this period changes in brain size resulted in a doubling of cranial capacity, whatever that means. Although there were few dramatic changes, the maximum expression of qualities such as differentiation and refinement, had increased very conspicuously by the end of the phase.

**Step 3: Late Acheulian, Mousterian, Middle Stone Age, etc. (.2–.04 Million Years Ago).** In hindsight, this phase appears as transitional between subhuman and fully human capabilities. The first burials, grave offerings, and traces of cult come in during this span, and the first engraved artistic squiggles. The first forms that are explicitly designed for hafting appear in this span, although this practice may have begun earlier. The maximum degree of differentiation of design increased sharply. Regional differentiation of rule systems became pronounced, but both are still at markedly lower levels than in Step 4.

**Step 4: (.04 Million Years Ago, Upwards).** The maximum level of design complexity and of differentiation again rose sharply. Explicit traces of representation and abstract art appeared in areas as far apart as Europe and Australia, and then became common. Traces of ritual and overt symbolism became more and more frequent, and the maximum scale of these increased. Regional differentiation of rule systems became increasingly conspicuous, and the turnover in design norms or style became increasingly rapid.

Step 4 material culture has long given archaeologists a feel of being organized on much more elaborate principles than Step 3, and there is still heated debate over whether the change from 3 to 4 involved the spread of genes determining superior capabilities. Alternative hypotheses more recently advanced suggest the spread of cultural and/or linguistic innovations that put behavior across a crucial organizational threshold, perhaps a cognitive and communications equivalent of the agricultural revolution.

The comparative richness of Upper Paleolithic material culture, particularly in Europe, has stimulated a voluminous and varied body of literature. Most archaeologists familiar with the field seem to be convinced that they are dealing with the products of human societies in possession of the full biological capabilities of our species as it exists today. In other words, the archaeology of this period can be treated as a segment of ethnography. It appears that variety among cultures that have existed during the last 30,000 years is to be regarded as due to the differential accumulation and modification of traditions disseminated in a reticulate communications web, involving varying degrees of specific adaptation and partial isolation. Grahame Clark has discussed the humanistic significance of the dawn of self-consciousness and the growth of symbolic activity that the bodily adornment, burial practices, and art of the period would seem to indicate. Alexander Marshack's work has also stimulated renewed awareness of these aspects of the Upper Paleolithic. I find it hard to evaluate in detail the claims that some of the engraved bones of this
period represent systematic notations of lunar cycles, and so forth. However, his work has shown clearly that the markings are organized in a much more complex fashion than had previously been realized. If prehistorians are correct in their supposition that the Upper Paleolithic societies had modern levels of ability in cognition and organization, then Marshack's findings are perfectly credible. They affect the date that we put on the achievement of present levels of linguistic capabilities rather than the question of the stages and processes by which they originated. Many other workers are also pursuing careful analytical studies of social organization, style, symbolism, and cultural marking for this time range, so that a much more detailed understanding must emerge in a few years time.

**Part II. Archaeological Reconstruction of the Behavior of Early Hominids: The Role of Language**

Another approach that has value for our present inquiries is to ask what we know about the way of life of early hominids. What were the influences that encouraged the development of language capabilities? Two lines of evidence can contribute: one is the morphology of fossil hominid bones which provide indications of changing appearance and physical capabilities; the other, which is probably more important for our purposes here, is the archaeological record of activities. It should be stressed that artefact studies of the kind to which the attention of Part I was devoted constitute only a small part of modern Pleistocene archaeology. In addition to serving as repositories of fossilized information, the stone implements serve as indicators for the location of hominid activities. Through association with artefacts, archaeologists can identify traces of diet, butchered carcasses, and camp sites. Further, the location of the traces in a reconstructed paleoenvironment gives important additional clues to the ecology and land-use patterns. It is to the interpretation of economy and activities that much of the attention of current research is devoted.

Details of the evidence are clearly beyond the scope of this essay (see References 15–17), but I can offer a brief summary. Researches, mainly along the Rift Valley in East Africa at localities such as Olduvai, the Omo, East Rudolf, Chesowanja, and Hadar show that by two to three million years ago, the adaptation of at least some hominids involved the following ingredients:

**Bipedal Locomotion.** The forelimbs were free of supportive and propulsive functions. This is clearly documented by postcranial fossils from South and East Africa.

**Tool-Making.** The purposive transportation of materials over at least several miles is most clearly documented by the quantities of flaked stone at archaeological sites that are often remote from sources of rock. Presumably sticks, fibers, and skin were being shaped and carried, as well as stone.

**Meat Eating.** The hominids were consuming quantities of meat including flesh from carcasses of animals much larger than themselves. Examples include proboscideans at Olduvai and a hippo at East Rudolf. This aspect of diet and activity is evident from recurrent associations of artefacts at butchered carcasses, and the repeated presence of scatters of broken-up bone where discarded stone artefacts also occur. Until now we have found it difficult to distinguish between bone refuse from hunted as opposed to scavenged carcasses, although Elizabeth Vrba, working in the Transvaal, has recently found some promising criteria. It is clear that the early hominids were more strongly carnivorous than any other living primate, and one
suspects that, like other large carnivores, they got their meat from an opportunistic combination of hunting and scavenging.

**Gathering (?).** As yet, we lack direct evidence regarding the consumption of plant foods by very early hominids, but everything we know about primates and about nonfarming peoples in the tropics suggests that plant foods would have been of crucial importance, presumably at least 70% or 80% of the diet. We do not know when the shift occurred away from the feed-as-you-go mode characteristic of primates to the common human pattern of gathering followed by preparation and quasicollective consumption. As we have seen in Part I, the quantities of stone may imply the existence of bags or baskets. I will return to comment on the probable importance of gathering in early socioeconomic systems.

**Home Bases.** The existence of dense patches of discarded artefacts at specific localities in the paleolandscape is clear evidence that early hominid activities were at times spatially focused. The coincidence of food refuse at these sites seems to imply that in some degree the human institution of camps or home bases had come into existence. From such a focus, different members of a social group could have gone out and engaged in separate pursuits, returning later, confident of rejoining the band.

**Food Sharing.** The presence of scatters of broken-up bone in coincidence with scatters of discarded artefacts implies that meat was being eaten. When, however, as at Olduvai and Koobi Fora the bones derive from several different cracasses which are unlikely all to have been freshly killed at the same spot, then the evidence also implies that foodstuffs were being carried back to the home base. Perhaps it was transported to feed infants, but it seems very likely that the archaeological evidence attests to the beginnings of a crucial evolutionary shift into food sharing and partial division of labor. We have direct evidence only of transport and sharing of meat foods, but if the sharing involved reciprocity between segments of the group, then gathered plant foods, which may well have been the staples, would have been as important, or more so.

Considered individually, these behaviors that archaeology shows were established by 1½–2 million years ago, are not exclusively human traits, but all of them have been developed to a much higher intensity and level of importance in man than in any other primate. If we look at them we see that they are a functionally interrelated set, such that each component reinforces the utility of the others; many of the traits are not possible in isolation. Thus bipedalism allows for the transport of equipment and of food for sharing; stone tools enable a primate to cut up a large carcass as effectively as a carnivore; digging sticks give access to additional underground food sources; bags and trays allow gathered foods to be carried, and so on. In addition, gathering and food sharing served as an insurance policy that made it possible to engage in the quest for meat, even though that was an enterprise which might succeed only once in three attempts.

Thus it can fairly be said that bipedalism, the transport of materials, and the manufacture and use of equipment, together with food sharing, constitute an adaptive complex of great importance in the differentiation of men from apes. The archaeological evidence is consistent with the notion that these behavioral modifications and the bodily changes that made them possible are the foundations on which the superstructure of human evolution has depended.

But what has all this to do with the origin of language? It is entirely conceivable that this kind of adaptive strategy could be operated by creatures with apelike social behavior patterns, but it is also clear that the adaptive value of food sharing and division of labor would be greatly enhanced by improvements in communication; specifically, the passage of information other than that relating to the emotions, becomes highly adaptive. This has proved to be the case also in other zoological
phyla that have made the acquisition of food a collective responsibility, as is shown, for instance, by the development of the so-called language of bees and other social insects. Thus I would argue that archaeological researches on relicts from the time range before one million years ago contributes in a crucial way to our understanding of the milieu in which capabilities for language were first important.

We can now look at the way in which the separate approaches of Part I and Part II of this paper fit together. I can best do this by offering an archaeologist's view of the stages in development.

**Phase I.** The establishment of the first protohuman adaptive complex (bipedalism, transport, tool-making, food sharing). We do not know when this evolutionary shift began, but its effects were sufficient for them to be archaeologically detectable by about two million years ago. However, hominids of those times may well not have been human at all, in our sense.

**Phase II.** The establishment of this adaptive system put selection pressure on the enhancement of communication and information exchange systems, which presumably began to develop even during Phase I, but which went on to mature during Phase II. Archaeologically, this finds expression in the long oscillating record of such Lower Paleolithic entities as the Acheulian, which span the time from around 1½ million years ago to 0.1 m.y. (i.e., 100,000 years ago). As we have seen, there were developments in the level of technique and design complexities, but by our standards they are not large in relation to the vast span of time involved. In spite of the somewhat monotonous character of this phase, it must have been the main formative period for human cultural and communications capabilities. On the basis of present evidence, I imagine that if we could observe the hominids of 1½-2 million years ago, we would first of all be struck more by differences from our sense of what is human than by similarities; by the end of Phase II, a host of indicators imply a basically human grade of organization.

Much has been made of the evolutionary influence of big-game hunting on human development in this phase. Hunting may have been influential to a degree, and doubtless the success of intensive hunting patterns such as those in evidence at Olduvai BK, Olorgesailie DE/89, or at Torralba did exert their own evolutionary influence. However, I would surmise that selection pressure has in fact favored all those qualities that facilitate varied and flexible way of making a living, of which hunting was one when the need and the chance arose. Our evolutionary niche is probably best described as opportunism, and language is surely the foremost of the skills that make us such effective opportunists.

**Phase III.** The maturation of cultural and presumably linguistic capabilities during the Middle Pleistocene seems to have opened up new potentials. Between about 50,000 and 100,000 years ago the archaeological record documents a quickening of the tempo of change. Finally, about 30,000-40,000 years ago, the record gives the appearance that a threshold was crossed with the emergence of much more complex and more style-ridden systems of material culture. From this same period, as we have seen, come the first surviving manifestations of art and of bodily adornment. At present we really cannot say whether the change of tempo and the apparent crossing of a threshold is due to some kind of discrete innovation that created a surge of change that looks like a discontinuity, or whether we are seeing simply the trace of a critical bend in a geometric or hypergeometric growth curve. As far as I am aware, Kenneth Oakley was one of the first to suggest that crucial developments in language may provide the best explanation of the Upper Paleolithic cultural spurt. This remains an untested, but, in my view, very plausible hypothesis.

The interpretations of Lieberman and Crelin can be viewed as potentially related, but I feel that there will have to be a careful appraisal of their results by
anatomists and speech physiologists before archaeologists should incorporate them in their arguments.

Much of what has been set out in both Part I and Part II of this paper is necessarily speculative. It is certain, however, that the evolutionary enlargement of human language capabilities did take place as a concomitant of the technological and socioeconomic developments to which the attention of archaeology is usually confined. I have sketched two aspects of the perception of human evolution that an archaeologist gains from evidence in the ground. I hope that this mole’s-eye view can be brought into a profitable relationship with other patterns that are described by anthropologists, ethologists, and linguists, each viewing the problem from a different stance.

Acknowledgments

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References


