Conceptual Issues in Modern Human Origins Research

G. A. Clark and C. M. Willermet
Editors

ALDINE DE GRUYTER
New York

28

The One and the Many

Epistemological Reflections on the Modern Human Origins Debates

JANE MAIENSCHEIN

"There is grandeur in this view of life," Darwin (1859) wrote persuasively in the first edition of his *On the Origin of Species,* "with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved." Theologians immediately took up the issue of who or what may have done that original breathing that started the whole evolutionary process. Scientists have taken up the other issues about how the process works, and to what effect. The question whether life was initially breathed into one form or into several has not seemed terribly important scientifically. Nor is it. Yet, if we substitute evolutionary processes for the breathing of an implied creator, the issue of whether humans began as one form or several takes on absolutely central importance to many. Scientists and laymen alike are persistently keen on knowing about the historical origins of modern humans. They want to know whether there was one ancestor (or one type, specifically Adam and Eve) or several (perhaps corresponding to different current races).

While we have come much further than Darwin in gathering piles of data and framing a plethora of hypotheses, we have not achieved anything approaching consensus around any one answer. Did modern humans arise once, in one place, and radiate outward from there, replacing other competing forms as they moved onward? Or did modern humans originate in more than one place and later join genetically so that their evolution was more continuous than discontinuous? How many different lines point to modern humans? And how can we know?

Science writer James Shreeve (1995:252) has taken up these questions in his fascinatingly rich exploration *The Neanderthal Enigma.* After interviewing more than 150 scientists and traveling to dozens of distant field sites, collections, and labs, he admits that he seems to have "come away with one hundred and fifty different points of view. Early modern humans appear first in Africa. No, they

don't. Or it depends on what you call early. Or how you define modern. Or what you really mean by human. I indexed my notes, and indexed the indices. A city of Post-it notes grew on my office wall, each with a revelation scribbled on it. Arrows of blue chalk sprang up to link brainstorm to brainstorm. But the arrows sprouted question marks. The Post-it notes lost their sticking power and fell to the floor."

This confusion remains one of the most intriguing aspects of scientific study of this issue. Identifying the origin of modern humans is one of the most compelling questions for the public and they want to know *the* answer. For as Shreeve notes, there is a fact of the matter: "The past did, in fact, *happen,* and in only one way." Yet scientists disagree about what that one way was. They disagree not just about the conclusions or about which theory or answer they like best. They also disagree about how to go about knowing the answer. They adopt different paths to knowledge, count different claims as established and legitimate, and point to quite different objectives—or different views of what, precisely, they are trying to know. This is a case where scientists are working in the largest sense on the same broad set of questions. Yet their work differs widely because of their fundamentally divergent epistemologies, or what may fruitfully be called different epistemic styles.

Traditional paleoanthropologists concentrate on bones and teeth. Collect all the relevant fossil skulls, teeth, and bones. Observe, measure, compare, and construct a lineage or phylogenetic tree of presumed morphological characteristics to show their evolutionary relationships (which assumes, of course, that there *are* evolutionary relationships). Deciding what counts as "relevant" requires some judgments, obviously, but researchers in each tradition will agree on the basic approach. The ideal result is, rather like Othniel Marsh's famous lineage of increasingly larger horses for New York's American Museum of Natural History, a compelling sequence showing the clear trend toward the modern.

Unfortunately for this approach, researchers often have only a few samples (few relative to all the probably different samples that ever existed) and must interpret quite liberally. As a recent news story in *Science* puts it, "When paleontologists disagree, they rarely have the luxury of doing another experiment to see who's right. Instead, they must resort to a more chancy and time-consuming enterprise: returning to the field and unearthing more fossils to prove their point" (Culotta 1995:1851). Computer modeling can help with recording increasing amounts of data in the form of measurements, for example, but gaining anything that can be counted as "knowledge" from the sequence requires expert interpretation, strong persuasive powers, and probably significant scientific status if one wants to challenge existing views. Some specimens are decayed, poorly preserved, sloppily collected, and otherwise not "pure" or very useful. Individual differences also complicate the story, since some of what may look like distinctive and significant differences may simply result from odd characteristics that are essentially outliers from the norm. So resolving disputes about early lineages

takes researchers back to the field for more digging, more fossils, and hence more of what they consider useful evidence.

Others look in other directions for evidence. The second traditional area focuses on behavioral or cultural phenomena. What evidence can be gotten from bits of shards, flint, and other artifacts found along with the fossil bones and teeth? What do they suggest about the life of the populations involved, and about the connections or lack of communication between diverse populations? Again, a good deal of interpretation is required to move from fragments to stories and constructed lineages. Does the apparent purposeful placement of parts of skeletons indicate a burial site? Would such a site indicate ritual and conscious respectful treatment of the dead? Does the appearance of apparently ornamental spear tips reveal sophisticated social interactions and perhaps language? Do cave paintings claim territory, represent spiritual interests, or serve as representations of experiences? Each datum offers much room for possible alternative interpretations, but within this tradition there is no doubt that it is this kind of data to which we should ultimately turn to establish relationships among different populations.

It might appear that, as scientists, all researchers would want to accept whatever evidence they can get about these past times. And some do, of course. But most favor one type or another. They have to think that the data offered is sufficiently grounded and sufficiently warranted to count as evidence of something before they consider it worthy of discussion. To the first group, the jaw bone in hand represents solid, reliable, undeniable "fact" while claims about burial sites or artifact production or hunting behavior seem highly interpreted and based on grounds too weak to be accepted at the same level of certainty. Thus, they insist, hard facts—by which they mean fossils—must prevail.

The second group disagrees. To them, the bones are not so solid. Indeed, most are fragments and all are subject to disturbance and distortion. We have only to recall the Piltdown adventure to see how easily susceptible researchers can be manipulated into believing that they have actually found just what it was they had been looking for. For these researchers, it is the cultural evidence that is clearly more reliable, because they believe that we can trace clear patterns of behavior. The same patterns of any particular behavior represented over wide areas must reveal continuous culture, and therefore continuous biology. For them, such evidence about human relations is necessarily far stronger than some easily scattered or altered physical tidbits.

So some see the primacy of fossils as the source of useful knowledge. Some look to a combination of fossils and behavior. And others insist on the primacy of behavior to establish claims about human relationships. These traditions have settled into their separate niches and thus coexist more or less peacefully within anthropology departments, and they vie with each other for support and prestige and priority with respect to particular issues. These traditions all share in such discussions as which techniques work better and are more reliable for dating, for example, recognizing that the answer may differ for dating such different phe-

nomena as geological strata or bones or seeds. As most of the chapters in this volume show clearly, which tradition one works within correlates with a very high degree of probability to one's background and training, reinforced by continuing networks of professional contacts with researchers and ideas that share the same assumptions.

Then along came mitochondria. As Lynn Margulis has convincingly established, this little powerhouse within the cell's cytoplasm almost surely evolved symbiotically with the cell. Presumably a small organism (in the form of the mitochondrial ancestor) found it advantageous, in the sense that natural selection preserved the trait, to team up with a larger cell. The mitochondrial body came with a strand of its own DNA, which has slightly different traits than the more familiar DNA associated with nuclear chromosomes. Since the cytoplasmic material is inherited only from the mother, while the father contributes only nuclear material, all mitochondrial DNA (mtDNA) is passed on exclusively through the female line. This makes it simpler but also less complete as a record of past changes. Other characteristics of this mtDNA that make it particularly appealing for research into ancestral lineages include its relative linear stability (it does not recombine to the same extent that nuclear DNA does) and its apparently higher rate of mutation. The stability means that the DNA chain reflects more neatly the actual evolutionary past accumulation of adaptations, while the increased mutations mean that there is more to look for to establish differences in different organisms. Study of mtDNA has therefore produced great excitement in the community of scholars studying modern human origins.

Yet once again, what might look like a lovely new approach to an old problem has received mixed reviews. This new approach is valuable only for those who value it. Not everyone does, and critics point to a variety of problems. They all amount to concerns that the mtDNA is too far removed from actual physical attributes and from the phenotypic and cultural characters they are associated with. Too much interpretation is thought to be involved as researchers take the mtDNA, remove it, track it, plot it, compare it, and otherwise engage in manipulations and laboratory techniques far removed from actual, living, breathing organisms. These critics are not neat hereditary determinists, obviously, who feel that phenotype is just a small and relatively insignificant step from genotype.

How one feels about mtDNA evidence, then, all comes down to whether one regards it as evidence—and of what. Is all this information and fact really evidence of anything that matters for current considerations about modern human origins? Perhaps if this approach had not from its earliest uses been linked to one particular theoretical interpretation of modern human origins, which was itself associated with one research tradition, the dispute about its usefulness and validity might have developed differently. But it did not. Mitochondria entered the anthropological world most noisily in the company of Eve—mitochondrial Eve, presumably the mother of us all. It is this claim about a single origin and replacement that has made the approach so controversial, especially to those who hold another hypothesis associated with a different tradition.

Within these competing epistemological traditions lie various theories. With respect to modern human origins, some stress one line leading to humans while others stress multiple lines. Since there is undeniable empirical evidence that more than one line of beings that looked remarkably similar to humans existed in the past, the key question has become whether one line was sufficiently dominant that it, in effect, replaced all the others. Thus emerges the Out of Africa hypothesis, which emphasizes origins of a line in Africa that radiated outward and replaced all other pre-human lineages. While there were once arguments for a single origin in Asia, among those favoring one origin Africa has gained priority as the probable center. Those who see origins in Asia, therefore, point to multiple lines to modern humans.

Interestingly, physical anthropologists differ about which theory they prefer. So do cultural anthropologists. Thus, the competing theoretical frameworks cross epistemological lines. Other factors also enter discussions of theory. For example, there is a history of insisting that different human races have biological significance. Obviously, this view appeals to those with political and social reasons for wishing to establish that different humans are essentially and biologically different. Yet while by definition those holding this view see significant racial differences—either physically or culturally—not all are racist in the political sense which insists that particular races are, as a result of the biological differences, inferior in some important and relevant way.

William Howells (1944:220) acknowledged the tendency among anthropologists as well as the public to see races, and in his popular *Mankind So Far* he noted that

> The answer to this, and to race, would seem to lie in the "origin of species," which I have already described. Evolution is a matter of constant change. . . . Perhaps the essential thing is whether animals or men breed as a single group. If they do, they will share their bodily features, and all their changes, and remain the same race. If they do not, they will not undergo the same changes, and they will become different. This is how two or more new species are formed out of one old one. At an advanced stage in the process there will be different adaptations, but the earliest differences to appear are mostly random and of little biological significance, and these are the kind of differences which distinguish the races of man.

For Howells, the evolutionary account seemed obvious, and the breeding criterion for races (or species) equally certain. Yet, how can we establish that different lines of past beings could interbreed? What will count as evidence for the claim that they could? Will we rely on morphological comparisons and assume that similar-looking folks will like each other enough to breed? Or will we look to cultural differences and similarities to establish patterns of social and physical intercourse? Or, perhaps, we will let DNA decide the issue.

This is precisely the set of issues surrounding the fate of the neandertals. Where do the neandertals fit: on the yellow brick road to us, or off on a side track which dead-ended when another line prevailed? Did the neandertals interbreed

with the line which seems most likely to have given rise to us—or not? And how can we know? For a long time the former view that neandertals were our ancestors dominated, but the view was not unanimous. As Howells put it in 1944, "The niceties of neanderthal anatomy, with which we have been grappling, are hardly a subject for bathtub reading, though indeed I have barely scratched the surface. The neanderthals are of incomparable importance to the question of our own past, even though anthropologists are to a great extent still up in the air over their significance. The problem of their origin remains obscure." Acknowledging what looked like a family resemblance, Howells asked whether the neandertals "resemble us for the reason that the two of us are closely connected—that he represents a sort of last step in evolution before our own type grew out of his? If that is so, why is our head, which is no bigger than his, so different in form? Or does he resemble us because both species have responded to the same evolutionary tendencies to have large brains and shortened jaws, even though we and he have led separate developments for ages? In sum, I am not much inclined to see neanderthal blood in these perfectly good specimens of *Homo sapiens,* and when I see how other people arrive at that idea by totally different routes I am still less inclined than before" (Howells 1944:173, 188). He preferred the view that races are insufficiently established and thus that there is continuity among all the existing human forms. Yet they derive from different lines than the neandertals.

But the view that the neandertals are *not* in line on the way to us, which suggests a different lineage, raises other questions. If the neandertals were around in what looks like the same place at what looks like the same time, why did they *not* breed with the line that evidently *did* give rise to modern humans? Was there insufficient similarity or too little attraction to interbreed? This seems implausible. Yet no other clear answer has emerged. So, once again, the debates fall back into traditional assumptions about what we should count as evidence and how to go about drawing conclusions when we are faced with uncertain situations.

We come back to the difference of epistemological norms, and what may be usefully called different epistemic styles. They exist. We see how they play out in this central anthropological question about modern human origins. It is not the case that different theories simply drive researchers to different methodologies or approaches, though that may happen of course. Rather, there are basic and deep underlying differences in epistemological assumptions.

But why? Is not science supposed to discover the one best answer? Is not the scientific method supposed to allow us to get beyond such differences and resolve disputes by testing and falsifying and otherwise determining which hypothesis is best? Or maybe even which one is true and tells us how nature really works, according to some views of the nature of science.

Perhaps the persistence of competing views for over a century suggests a failure in the robustness and innovation of the scientific approach to the study of modern human origins. But, no, not necessarily. As Willard van Orman Quine and Pierre Duhem have explained, any view of science is naive which expects

definitive resolution in the face of all competing claims about evidence and competing views about preferred approaches (Quine 1981:70–72). There is no reason to think that the research is not scientific or that it is bad science simply because it has failed to reach a resolution. In other fields where there is little public interest in the answers, researchers would likely have turned to other questions more amenable to solution with the available methods and waited for new approaches to settle the debates. But this issue matters too much to too many people, and as Shreeve points out, people want to know the fact of the matter. Given the lack of evidence accepted as decisive to all sides, this is a special challenge indeed—and it causes special problems.

One problem is that there are different virtues and different values in science, and that the different traditions are weighing these differently. For example, empirical adequacy, simplicity, coherence, consistency, robustness (or the ability to explain more different phenomena), or aesthetic criteria (creativity, uniqueness, or beauty) may seem more important in a theory. Getting more data, getting it faster, having more different kinds of data, or getting "better" (cleaner, more reliable) data may serve as different criteria for "goodness" of methodology, as may a host of other considerations. Being creative and expansive beyond the basic data may be preferred in one camp, and may provide exciting stimulation for new research. Being careful and failing to rush ahead beyond the securely grounded data-in-hand may seem preferable to others. Even though everyone may agree that these are virtues, the virtues are weighted and combine in different ways.

The bones-and-teeth fossil followers want data in the form of morphological lineages which show clear progressions and which reveal predictable evolutionary trends. They want relatively solid foundations for their interpretations. Cultural anthropologists look for signs of cultural exchange, which will require different types of interpretation. Molecular biologists will take the mtDNA plottings as strongly signifying relationships, and they will consider this solid data. Complex theories based on cultural artifacts and conjectures will seem unacceptably fuzzy, humanistic, and perhaps vague to them.

So, different epistemologies exist, along with different theories and different available methodologies. They coexist peacefully until they ask the same questions, or questions close enough that they intersect. Then they vie for priority. Is there any way to step outside the competing views to establish what *really* should count as knowledge? Or, how can we establish claims not only that we know best about the empirical data out there, but also that we know that we know because we have somehow established that our view is best? Is there any way to produce knowledge that is objective and warranted independently of any of these epistemic styles?

No, there is not. Not really. Asking which view is right would involve determining which epistemic style is the right one. But that begs the question how we *know* it is the right one. We would have to presuppose some set of epistemic

values in order to determine which epistemic style is right, and we have no way to do that. Does this, then, mean that all is lost, that science is a hopeless muddle of babbling voices, and that all scientific contenders are equally good?

No, decisively not. For as logical positivists and social relativists alike would have it, scientific conventions (concerning epistemic style) may be unavoidable and fundamental, but some are better than others. Rudolf Carnap and Thomas Kuhn alike show us that adopting a particular framework or paradigm—that is, a set of epistemological assumptions—can often work better to accomplish the goals of the community (Creath 1995–1996; Quine 1981:70–72; Reich 1991). Appealing to community goals will not settle the issues for all times and all places since the community goals can change and different conventions might work equally well. And under the most favorable circumstances such a strategy can serve only to determine which of several competing conventions is best for achieving some objective that all share.

This is a pragmatic matter. It is not "truth" or logic that will determine which view is best, but practical considerations: which best solves the problems or provides answers to the questions that the community as a whole cares most about? Which offers the most robust set of predictions or addresses the widest range of diverse issues? Such practical considerations will, in general, prevail. Yet, obviously there may be more local communities with competing views—as we have in the case of modern human origins. The larger community can tolerate such competition and can wait for further lines of research, more of what will count as evidence, or shifting epistemologies.

Given this view, can scientific debates ever end? Yes. One way is that the proponents of all but one side die (either literally or intellectually). This could occur because everyone left declares that one side wins, or because the others give up—not necessarily because they are "right" or have the "truth" but rather because they have prevailed and are declared as the winners. This, however, seems unlikely in the present case since we have the leading anthropology departments continuing to train healthy new generations of Ph.D.s to do things the same ways, to ask the same questions, and to value the same kinds of answers. With a productive and full pipeline feeding each tradition, the situation does not seem likely to change dramatically very soon. Thus it does not seem likely that any one group will clearly "win" or that the others will quit.

Another alternative is that a new player changes the rules of the game, acquires an improved technique, or simply outplays the others in some way that the larger community accepts—perhaps simply because it is compellingly different. Briefly, it looked as though mtDNA might have provided such a technique as the hypothetical Eve looked out at us from every grocery store check-out rack from the cover of popular magazines. It looked as though this interpretation might take over. But no, her limitations were quickly revealed and the competitors returned to their own traditions. We cannot, of course, predict the next likely attempt at resolution, but a compelling account of the intricacies of biochemical evolution,

coupled with accurate dating techniques, could go far toward sorting out lineages and relationships. If genetic and biochemical evidence were to agree sufficiently with one or the other competing physically or culturally based interpretation, the alliance would make it much more difficult for the competition to sustain an alternate view. It would be pragmatically wise to go with what might then emerge as a clearly dominant alternative.

One final way to settle the debate is just to quit arguing and go work on some other research problems. Why do we care so much about modern human origins anyway? Why—scientifically—does it matter whether the cradle of humans was in Africa or Asia or Antarctica? Though these answers have different implications, why should we care—scientifically—which one? We could end the debate by abandoning this question altogether. Yet the stakes are probably too high. People care too much about the answer, often for social or political reasons. For example: some want to establish Africa as the center and to prove that all humans derive from black ancestors; others strive to establish the importance of either the similarities or the differences among populations of people who look different. But let us not confuse the inevitable social discourse and its insistence that the question of modern human origins should remain primary with "science"—for science, whether regarded as epistemologically valuable or rejected by its critics, is supposed to conform to a different and more rigorous set of standards than non-science.

Even those who argue about details of their preferred epistemology agree that science should be consistent with empirical study of nature, should be coherent and internally consistent, and should provide some predictive value. Eventually such a body of observations and such a coherent view emerges that the heliocentric universe pushes man and his earth out of the center, for example. Perhaps such a body of research will push early man out of the anthropological center and make us care less scientifically about the interpretations of modern human origins. Instead, we might focus on the larger intellectual issues of evolutionary development and the resulting complex patterns of morphological, genetic, and behavioral changes. Perhaps it matters little—scientifically—whether we believe that humankind began as one or many. Perhaps the anthropological community's epistemic values go far enough to show that it might be productive to postpone much interpretation and theory surrounding modern human origins until there is something more compelling to add. We could temporarily end the debates by putting them on hold until we get our various Post-it notes in order.

Darwin, after all, was content to leave us out of the *Origin* entirely, never mentioning our species even once. He knew the question of our origin would weigh foremost on his readers' imaginations, but that was a social issue and he was not ready to address it scientifically in the first volume of his famous trilogy. He did not know, nor was it a compelling scientific problem to determine the nature of the breathing or the breather at the first moment of creation of life. Nor was he scientifically prepared to address whether life was originally breathed into

one form or into many. Perhaps we are not ready to make scientific progress with these questions either, and it would be pragmatically wise to make progress pursuing various productive lines of research before investing more energy insisting on problematic larger interpretations.

For those who do insist on persisting with the debates, let them recognize that different epistemic styles exist, and that just as others are making contested epistemic assumptions, so they are themselves, and that all conclusions are conditional on those various assumptions. And let them recognize as well that resolution among the alternative styles will remain difficult, and that science will nonetheless persist in finding some approaches more useful in the long run—not necessarily because they are true but because they work better.