

# HUMAN EVOLUTION: THE VIEW FROM SATURN

Misia Landau  
Department of Anthropology  
Boston University  
232 Bay State Road  
Boston MA 02215

**ABSTRACT.** The evolution of bipedalism is considered a critical step in human evolution. To discover how it occurred, and whether it could have occurred elsewhere in the universe, scientists must study the structure of their theories as well as fossils. In particular, they must determine whether such critical steps are a function of the "data" or of the (often unwitting) use of narrative for, it will be shown, scientists tend to make sense of the past by telling stories in which everything leads up to or away from being human.

## 1. INTRODUCTION

People who study human fossils know their power. Like astronomers who look for life on other planets, they know that whatever they find will fascinate other human beings. Some capitalize on the public interest, others complain it depreciates their science. Yet all stand to profit from the public concern. Even those paleontologists who prefer fossil rodents to fossil hominids are more likely to find work if somehow it fits what NSF and certain private foundations call human origins research.

In other ways, too, the public has benefitted the study of human evolution. One of the greatest books on the subject, Thomas Henry Huxley's *Man's Place in Nature* (1863), started out as a series of "lectures for working-men." Nor were these lectures merely rhetorical exercises. For Huxley, "making things clear to uninstructed people was one of the very best means of clearing up the obscure corners in one's own mind." [1] Talking to the public was for Huxley a way of doing science.

Not that he shunned rhetoric. Figures of speech were powerful tools in Huxley's hands. Faced with the problem of persuading us that humans and apes are members of the

same zoological order, Huxley tries the following: "let us endeavor for a moment to disconnect our thinking selves from the mask of humanity," he suggests,

let us imagine ourselves scientific Saturnians, if you will, fairly acquainted with such animals as now inhabit the Earth, and employed in discussing the relations they bear to a new and singular 'erect and featherless biped,' which some enterprising traveller, overcoming the difficulties of space and gravitation, has brought from that distant planet for our inspection, well preserved, may be, in a cask of rum.[2]

Some might choose a better preservative but rarely a more effective rhetorical device. Paleoanthropologists still use such metaphors to imagine themselves objective observers, most recently David Pilbeam whose rhetorical vehicle takes the form of a Time Machine visiting the remote human past.[3]

Now, I was asked to say what the study of human evolution might contribute to the search for life on other planets but so far I have talked only about how we use extraterrestrial visitors to tell us something about ourselves. Yet my point is this: if we want to know whether humans could have evolved elsewhere in the universe we must take into account the fact that we are inescapably biased when it comes to our own evolution here on earth. On first hearing this message will not sound new. Even Huxley was the following the Greeks for it could be said that his scientific Saturnian merely embodies Socrates principle of irony: that to see ourselves as we really are we must be something else.

One of the most recent twists to the problem of bias in human evolution comes not from a paleoanthropologist but from an astronomer, Brandon Carter. Unless we take account of the larger astrophysical context in which life on earth has occurred, Carter warns, we may misinterpret the fossil record. In particular, we may see long term trends where none exist. Given the relatively close correspondence between the age of life on earth and the age of the sun, it appears that too much time has passed for Darwinian evolution to have acted in a steady trend-like manner. More likely it has operated erratically, "at many intermediate stages which were not teleologically directed towards our present state or any other long term goal but were directed towards immediate advantages in stochastically changing environmental conditions." [4] If so, Carter concludes, many of the apparently critical stages in our evolution were quite unnecessary. Indeed,

the appearance of an evolutionary ladder is largely an illusion: "an artefact of our still unduly anthropocentric imaginations, which lead us to jump too easily to the conclusion that merely because we happen to possess some attribute it must be essential for 'higher development'." [5]

Astronomers may have reason to disagree with Carter. Some paleoanthropologists will, for though they are generally aware that the evolutionary ladder is a human construct, they frequently talk in teleological terms. This is true not only of their public discourse but of their scientific communication. Take, for example, Stern and Sussman's recent description of "The locomotor anatomy of *Australopithecus afarensis*" which appeared in the *American Journal of Physical Anthropology*.

In our opinion *A. afarensis* is very close to what can be called a "missing link." It possesses a combination of traits entirely appropriate for an animal that had travelled well down the road toward full-time bipedality, but which retained structural features that enabled it to use the trees efficiently for feeding, resting, sleeping or escape. [6]

Metaphors cast powerful spells, as Huxley realized, not only in everyday life but also in science. Nor are they the only rhetorical forms to exert such an influence. When Stern and Sussman say that "*A. afarensis* had travelled well down the road toward full-time bipedality," not only do they speak in metaphor they also tell a story.

## 2. NARRATIVE APPROACHES TO THE PAST

I have talked elsewhere about the use of narrative in the study of human evolution [7] but for the purpose of introducing my argument here I refer to an essay, 'Narrative form as a cognitive instrument,' by the historian Louis Mink. Speaking of history as though it were a form of time travel is not an entirely metaphorical enterprise, Mink argues, for

We do in fact acquire and carry with us in imagination some sketchy outline of historical development over long periods, just as we acquire and carry with us imaginative sketches of geography, and in both cases we know that the vast areas of vagueness can if necessary be filled in with detail. [8]

Thus we know that Rome rose and fell, Mink continues, in the same way that we know Tokyo is somewhere in that general direction. Similarly, it could be said, we depict our hominid origins in much the same way most of us point to El Salvador: in broad imaginative gestures.

If we accept this, if we agree with Mink that there are narrative "routes" from events in the past to events in the present, then to understand the course of human evolution we must look not just at the structure of fossils but also at the narrative structure of our theories; we must look not only at the hindlimbs of *A. afarensis* but also at the way paleoanthropologists move them from quadrupedalism to bipedalism, from bipedalism to big brains, meat-eating and walking on the moon. This is my intention. For the point is however compelling fossils appear, their power depends largely on how we view them in relation to stories; to stories within stories. To see what we know about human evolution, then, we must look at the narrative routes by which fossils appear to move down that well-worn path, "the road to humanity." To do so, I might add, is to support Carter, at least in his critique of teleology. My aim, in fact, is to show how the evolutionary ladder which constrains much paleontological thinking is embedded not in the earth but in human practice: in the tendency we have to make sense of our past by telling stories in which everything comes out right -- that is, human -- in the end.

### 3. THREE ROADS TO BIPEDALISM

Let us begin, then, like Huxley's scientific Saturnian by looking at this "erect and featherless biped" called *Homo sapiens*. Even with no personal interest in the subject we would have to agree that humans are unique in the way they move about bipedally on this planet. True, certain marsupials are bipedal as are some rodents. Bears sometimes move in an upright fashion and birds, after all, are erect if feathered bipeds. Apes stand up and move on two legs, as Huxley emphasizes in the drawings in the first chapter of *Man's Place in Nature*, and indeed many non-human primates can walk bipedally. Yet the fact remains: not one of our primate relations uses bipedalism in a regular manner as we do. Not one of them is a habitual biped. However proud we humans may be of this fact, scientists interested in the evolution of bipedalism may be troubled. For as any Saturnian knows, it is very difficult to formulate laws on the basis of a single case.

Paleoanthropologists do not need Saturnians to show them their logical limitations or that there are other ways to do science besides induction. Yet in formulating their

theories many behave as though bipedalism is not only a necessary but also a sufficient condition for the emergence of hominids. As Friedrich Engels italicized in his classic 1876 paper on human evolution, the erect posture was "the decisive step in the transition from ape to man." [9] Engels was not a paleoanthropologist, strictly speaking, nor was he the first to argue that "posture maketh man" for Ernst Haeckel said much the same thing eight years earlier, as Gould has shown. [10] Yet whereas Haeckel was reluctant to link the brain and upright posture so as to avoid "the dualistic and teleological philosophy of past times and the idea of reason as the Divine Spark," [11] Engels makes the connection central to his theory. Once the decisive step had been taken, and here again Engels uses italics, "the hand had become free and could henceforth attain greater dexterity," first as an organ of physical labor and then as an instrument of discovery and invention. Depending on how you read it, *The Descent of Man* tells a similar tale for, according to Darwin, "Man could not have attained his present dominant position in the world without the use of his hands which are so admirably adapted to act in obedience to his will." To make tools, to hurl stones and spears---"for these causes alone it would have been an advantage to man to become a biped." [12] For Darwin even more than Engels, bipedalism was a form of mental as well as bodily progression.

While neither Darwin nor Engels refer to the paleontological record it is remarkable how many paleoanthropologists have followed them. Leading hominids down the road to bipedality by their tool- and weapon-using hands has been a common 20th century custom, as Gordon Hewes so nicely summarizes in his classic 1961 paper, 'Food transport and the origins of hominid bipedalism.' [13] Not that everyone has followed the path set out by Darwin. Hewes himself opened a whole new approach to the evolution of bipedalism by proposing that the arms and hands were freed to carry food rather than to use tools and weapons. Fossils no longer needed culture to be bipedal. Given that none of the South African Australopithecines had been found in direct association with stone artifacts, this was a decided theoretical advantage. Yet few followed Hewes when he first proposed his theory. Indeed, *Homo habilis*, discovered that same year (ie. two years after Sputnik), bears in its name the emphasis on technology which dominated the most influential theories of the time. [14]

By the early 1970's, however, and in particular with the publication of Clifford Jolly's 'The seed-eaters,' the shift away from cultural explanations gained momentum. According to Jolly, the first hominids used their hands not to carry tools or even food but instead to nimbly feed on seeds and other small grassland resources inaccessible to

less dextrous mammals. "They would thus have attained a stable, adaptive plateau upon which they could have persisted millions of years, peacefully accumulating the physiological adaptations of a terrestrial 'open country' species." [15] So Jolly clears the way for a whole new steppe in human evolution. Indeed, this is one of his most significant contributions. And yet, stretching the link between bipedalism and culture over such a lengthy plateau, Jolly nevertheless draws the connection. As he argues, the skillful hands, upright posture and reduced canines associated with seed-eating "would predispose the hominids to solve ... problems of adaptation by the development of their hominoid artefactual propensity into true material culture." [16] Not only that, the seed-eating mouth, with its highly-arched palate, capacious interramal space and absence of symphyseal shelf, could be interpreted as a preadaptation to articulate language. In short seed-eating would be "an ideal apprenticeship for an adapting biped."

#### 4. A DETOUR OVER FLAT TERRAIN

Looking at the structure of Jolly's argument it is clear that, however stable, seed-eating is less a plateau and more a training ground for becoming human. Nor would Jolly deny this. Indeed he is quite explicit about his aim: to provide "a convincing causal model of hominid origins." It must also be said that compared to the "adaptive troughs" and "adaptive breakthroughs" figuring in recent theories of bipedalism, [17] Jolly's adaptive plateau is still one of the least teleological features to be found anywhere along the pongid-hominid horizon. The real problem with Jolly's theory is not so much its slant towards human beings as its lack of contour. For whether or not seed-eating was the first hominid diet, and so far there is little evidence that it was, to call our ancestors 'seed-eaters' is to construct what E. M. Forster, in fiction, calls a 'flat character': a character constructed around only one or two qualities or ideas. Mr. Gradgrind calling for facts, Mrs. Micawber calling for her husband -- those familiar with Dickens will recognize such figures by their limited number of facets. "The facets may be correct as far as they go," as Norman Douglas observes and indeed we may learn from them (for example, about Dickens's views on science and women), "but there are too few of them: what the author says may be true and yet by no means the truth. This is the novelist's touch. It falsifies life." [18] It falsifies life by making it readable.

## 5. AN ALTERNATE ROUTE

Mixed metaphors can be confusing, even to an earthling. Let me straighten things out, and suggest a possible alternative, with another bipedalism story told to me recently by another paleoanthropologist, Michael Rose. For present purposes it may be best to simply get to the moral of the story, which comes in four parts.

To begin with, there is no need (however great the desire) to treat humans as a special case, Rose argues, for we can explain bipedalism according to the same kinds of causal factors we use to explain knucklewalking in apes. Indeed, as Rose tells it, the story is not simply about humans or even hominids but about the evolution of all large bodied hominoids. Nor should we limit ourselves to single explanatory factors, and this is lesson number two, for in non-human and human primates bipedalism functions in different ways at different times: in feeding, social interactions, self-defense; while moving and, as Rose emphasizes, while staying in one place.[19] One minute a primate may stand on its hindlimbs to look for predators, the next minute to reach for a bit of fruit (though rarely, Rose notes, to carry food). Depending on when, where and how it is used, bipedalism can mean quite different things to a primate.

To reconstruct the evolution of bipedalism, then, and this is Rose's third point, we should look to the living primates not simply for specific morphological analogies but for broad behavioral and ecological similarities as well. Now, in a sense this is also Jolly's message. But whereas Jolly focusses primarily on baboons, Rose looks further afield. Using a whole range of living species, he sees extinct primates as composites. Indeed, he speaks of them in terms of "compromise." [20] Yet as a final matter of principle, Rose sees them as unique, unlike anything living today. At first glance such generalized fossil ancestors might appear even flatter than Jolly's seed-eater, but round characters emerge from broad outlines. By defamiliarizing fossils, by assuming they were unlike anything we have ever seen -- and capable of more than becoming human -- Rose gets us to see them on their own terms. Thus he avoids what is perhaps the greatest pitfall in paleoanthropology: the tendency to treat fossils as "transitional," as "like us" or "not like us"; in Sussman and Stern's terms, as "missing links."

Having used Sussman and Stern to begin my discussion of teleology I should say that compared to paleoanthropologists who in recent debates describe *A. afarensis* as an essentially human type biped, Sussman and Stern in fact see it much as Rose does: a rather generalized creature capable of a wide range of locomotor



activities, both in the trees and on the ground; bipedal and yet not like us. Rose even uses their description of the differences between humans and *A. afarensis* to develop his own argument. Yet while Sussman and Stern interpret these differences as signs that *A. afarensis* was a less efficient, less "committed" biped than humans, Rose sees them not as imperfections but simply as adaptations to a different kind of bipedalism, one designed primarily to cover short distances while maintaining the ability to move in the trees. Defining bipedalism according to the distance covered on the ground rather than along some road to humanity, Rose thus uncouples bipedalism from human values.

It is here that he departs most significantly from the narrative path taken by Sussman and Stern and by Jolly. Whereas Sussman and Stern ask how human-like was the bipedalism of *A. afarensis*, Rose turns the question around: how *afarensis*-like are humans? Where Jolly places fossils on a plateau verging on bipedalism, Rose treats each as a last step, the ending of a separate narrative route. How would *A. afarensis* look back on the evolution of bipedalism? This is more than a rhetorical question. Imagining ourselves small-brained bipeds may be even more useful, scientifically speaking, than imagining ourselves visitors from another planet.

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