Human Evolution as Narrative

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Have hero myths and folktales influenced our interpretations of the evolutionary past?

Scientists are generally aware of the influence of theory on observation. Seldom do they recognize, however, that many scientific theories are essentially narratives. The growth of a plant, the progress of a disease, the formation of a beach, the evolution of an organism—any set of events that can be arranged in a sequence and related can also be narrated. This is true even of a scientific experiment. Indeed, many laboratory reports, with their sections labeled "methods," "results," and "conclusions," bear at least a superficial resemblance to a typical narrative, that is, an organized sequence of events with a beginning, a middle, and an end. Whether or not scientists follow such a narrative structure in their work, they do not often recognize the extent to which they use narrative in their thinking and in communicating their ideas. Consequently, they may be unaware of the narrative presuppositions which inform their science.

Students of literature, on the other hand, are so conscious of narrative that some have argued it is storytelling which makes us human. As the poet Matthew Arnold declared in his famous debate with Thomas Henry Huxley, even man's remote ancestor, "the hairy quadruped furnished with a tail and pointed ears, probably arboreal in his habits . . . carried hidden in his nature something destined to develop into a necessity for humane letters" (Huxley 1963, p. 2). E. M. Forster, the novelist and essayist, located the origin of narrative in the Paleolithic: "Neanderthal man listened to stories, if one may judge by the shape of his skull. The primitive audience was an audience of shock-heads, gaping round the campfire, fatigued with contending against the mammoth or the woolly rhinoceros, and only kept awake by suspense. What would happen next?" (Forster 1954, p. 26).

Depicting Neanderthals as gaping shock-heads may appear gauche scientifically, and yet in tracing storytelling to the very roots of human history Forster anticipates one of the latest trends in scholarship in the humanities. So popular is this recent focus on narrative—not only in literary criticism but also in linguistics, anthropology, philosophy, and history—that the French have coined a term for it: "la narratologie."

The central claim of narratology is simply that human beings love to tell stories. "Our need for chronological and causal connection defines and limits all of us—helps to make us what we are" (Scholes 1981, p. 207). Narrative, then, is a "primary and irreducible form of human comprehension" (Mink 1978, p. 132), a defining characteristic of human intelligence and of the human species. Related to this assumption, though more controversial (Herrnstein-Smith 1981), is the idea that we have certain basic stories, or deep structures, for organizing our experiences. Each deep structure comes in many versions and in several different modes. For example, the Cinderella story is embedded not just in fairy tales but in novels, films, operas, ballets, and television shows. Some narratologists, stressing the central role of narrative in human experience, would further argue that we have not only different versions of stories but different versions of reality which are shaped by these basic stories.

One scientific discipline that appears open to the importance of narrative is paleoanthropology. Certainly the number of recent articles and books on the subject of bias in the study of fossil man, including one titled *The Myths of Human Evolution* (Eldredge and Tattersall 1982), suggests that paleoanthropologists are aware of the literary aspects of their study. Yet even these authors betray a lingering positivism, implying that more data and increasingly rigorous hypotheses will eliminate for good the subjective element. Few paleoanthropologists have turned to the humanities for a real contribution. Can the humanities tell us anything about science? Can theories of literary criticism illuminate the study of human evolution?

The purpose of this study is to address these questions. Treating specific theories of human evolution as narratives, it will be argued, can shed light not only on paleoanthropology but also on other scientific disciplines. Thus the aim is not to establish narratological theories, nor to develop a theory of scientific logic, but to test heuristically a method of epistemological analysis which, if persuasive, could lead to different ways of doing science. As background, it will be helpful to review the main literary approaches to narrative.

Two theories of narrative

Given the central claim of narratology—that human beings tend to tell stories, even the same stories, in almost everything they do—literary approaches divide along two broad lines, structuralism and hermeneutics. Despite some important theoretical differences, the two

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approaches converge in many of their basic goals and concepts (Margolin 1978). For example, both treat literature as a cultural system that is governed by a set of conventions and codes. Criticism thus consists of uncovering and reconstructing the rules and relations that govern literature. The two approaches diverge, however, in how they draw the boundaries of a literary system, and specifically how they delimit the text.

Structuralism defines a text as an autonomous object with a characteristic internal dynamic and treats literary features such as plot, character, and theme much as a systematist treats anatomical characters: as a means of description and classification. Reading a text, like studying an organism, is thus a way of discovering the principles of structure which operate not just for one text but for many (Culler 1975). Indeed, a major aim of structuralism is to construct models of the similarities between texts, to describe genres of literature in much the same way that a zoologist describes a new genus.

Hermeneutics proceeds quite differently. Rather than dissect a text to discover general structural principles, the hermeneutic reader subjectively interprets—indeed, animates—a text to find its individual meaning. Again, these differences in approach may be traced to the way the text is defined: whereas structuralists view the text as a complete and finished (though not necessarily isolated) object, in hermeneutics it is regarded as an open system, depending as much on the reader as on the author for definition, and therefore always changing. Hermeneutics thus attempts to show how a text is constructed by its reader. How does one make sense of a text? What are the conditions, rules, and mechanisms that govern reading?

Taken to their extremes, structuralism and hermeneutics may appear to approach the problem of narrative from opposite directions. One focuses on form, the other on meaning; one concentrates on the text, the other looks at the reader; one eschews subjectivity, the other emphasizes personal interpretation. Structuralists may claim that theirs is the more scientific approach, yet scientists themselves are probably more familiar with the hermeneutic brand of criticism, at least with regard to literary works, and possibly even to scientific writing. (Multiple interpretations and ambiguity are no strangers to readers of evolutionary biology, especially in the aftermath of the Darwinian centenary. A book published in 1966, titled *What Darwin Really Said*, by Farrington, was obviously not the last word on the subject.) Yet even students of hermeneutics would agree that structuralism has an initial advantage. By explicitly restricting itself to relatively simple models of the formal patterns and principles operating within a text and from one text to another, structuralism can provide a useful method for the more ambitious exploration of the different ways in which people tell stories.

Although there is no single structuralist methodology, attempts to find formal patterns and principles in literature may all be said to gain their impetus from a single book, Vladimir Propp's *Morphology of the Folktale* (1925). This seminal work begins by addressing the problem of how to classify and describe a large body of literature, namely, a collection of over one hundred Russian fairy tales. Dissatisfied with traditional classifications based on "motifs" such as witches, horses, or kidnappings, Propp observes that one of the most common aspects of the folktale is that it attributes identical actions to different people, animals, and objects. The actions are the constant elements of the tale, whereas dramatis personae are the variables.

Because they are defined from the point of view their significance for the course of action as a whole these invariant actions are termed "functions." A function cannot be defined apart from its place in a particular narrative because identical actions can have very different roles in different stories. For example, a hero may build a castle (the action) to pass a test, to protect himself or to celebrate his marriage (the functions).

Propp isolates thirty-one consecutive functions in the fairy tale, each of which can be fulfilled in numerous ways by diverse characters. Each function thus constitutes a paradigm, a class of items which can fill the same slot in the story. For example,

a	king or any villain	imprisons or any version of disappearance	the	queen's or any possessor	lover or anything precious

From the point of view of structuralism, narrative can be represented as a string of functional slots or paradigms. The significance of Propp's work, then, is that it provides a method which allows us to describe individual stories as variations on a basic narrative or deep structure.

Not that this method is without its faults. Indeed its flaws as well as its virtues have been an impetus to structuralists (Scholes 1974; Jameson 1972). With the limitations taken into account, the structuralist method is an attractive and powerful way to compare narrative texts which appear very different from one another. At the least, it helps in clarifying the common narrative elements in a body of texts. When applied to scientific writing, such an approach can make us aware of a simple fact: scientists tell stories.

Narratives of human evolution

For the purposes of this paper, a structural description of narratives of human evolution will be confined to the work of a specific set of British and American scientists of the early twentieth century: Arthur Keith, Grafton Elliot Smith, Frederick Wood Jones, Henry Fairfield Osborn, and William King Gregory. All were considered authorities on the subject of human evolution, although each had his primary training in another field, the British in medicine (Keith specializing in anatomy, Elliot Smith and his student Wood Jones in neuroanatomy), and the American Osborn and his student Gregory in vertebrate paleontology. Indeed, each was highly prolific on the subject of human evolution, with numerous scientific articles and several books to his name.

Though intended for a wide audience, the books of Keith, Elliot Smith, Wood Jones, Osborn, and Gregory were also seriously read and reviewed by scientists. Rather than mere popularizations or reviews of the literature, they often contained the first clear and complete expression of a scientist's views on human evolution, and are therefore well-suited to structuralist analysis. For

their authors, they often held a special place. Keith, for example, worried that his books would too quickly become "period pieces," that each new discovery would put them more out-of-date (Keith 1950, p. 384). In a sense he was right: we can identify the period to which a piece of paleoanthropological writing belongs by the fossils it takes into account. Encountering Piltdown man in Keith's phylogenetic discussions confirms most strikingly his worst fears.

Comparing Keith's discussion of Piltdown to that of Osborn or Gregory raises another issue, however. So variable are the descriptions that the question is not whether we can identify their publication dates but whether we can identify Piltdown. Like the kings and queens of Propp's fairy tales, Piltdown man can play several roles in human evolution, from missing link to the first Englishman.

This ambiguity extends also to descriptions of events in human evolution. Generally speaking, paleoanthropologists have recognized four main episodes: a shift from the trees to the ground (terrestriality), the development of upright posture (bipedalism), the development of the brain, intelligence, and language (encephalization), and the development of technology, morals, and society (civilization). Which episode came first has been an important source of debate; in fact, each of the five authors under discussion here proposes a different sequence, as shown in Figure 1.

Such variability in ordering is reflected in the way each event is described. For example, bipedalism is clearly a primary event for Keith. By his account it was a very complicated affair: bones, muscles, lungs, diaphragm, spinal nerves, cerebral cortex, even the vasomotor mechanisms controlling blood distribution are described (Keith 1923). None of this is mentioned by Elliot Smith, however; for him, the brain comes first so absolutely that his book *The Evolution of Man* (1924) almost gives the impression that our ancestors had no bodies. As with the hero of a fairy tale who fights a battle or slays a dragon to the same end, the human ancestor as seen by Elliot Smith develops a large brain for the same reason that Keith's protohuman becomes bipedal.

From this perspective, there appears to be some underlying agreement about what happens in human evolution. In constructing their theories most paleoanthropologists seem to have in mind a similar narrative pattern, which, for present purposes, can be represented in terms of nine functions. By stringing the functions along an axis and projecting beneath it the five story sequences from Figure 1, it is possible to derive—again, as a heuristic—a set of narrative paradigms, which can be seen in Figure 2.

Like many myths, the story of human evolution often begins in a state of equilibrium (function 1, the initial situation), where we find the hero leading a relatively safe and untroubled existence, usually in the trees. Though he is still a nonhuman primate—ape, monkey, or prosimian—he is somehow different (function 2, the hero is introduced). Often he is smaller and weaker than the other animals. The idea of development from humble origins is a common feature of myth and folklore; we have only to think of Cinderella or the ugly duckling to find familiar examples. Similarly, the idea of the human ancestor as one of the most helpless and defenseless of creatures is prevalent in accounts of human evolution, including that of Darwin (Landau et al. 1982).

Whether by choice or compulsion, the hero is eventually dislodged from his home. This change of situation, function 3, can be linked to either a change in environment or a change in the hero, for example the acquisition of a large brain (Elliot Smith) or upright posture (Keith, Wood Jones). Though the event that is chosen varies, it always precedes and in some way explains the departure of the hero. Function 4 thus marks the first turning point in the story. As suggested by the term "departure," this turning point is often depicted as the beginning of a journey or adventure (Landau 1981). The sense of a journey is especially strong in the accounts of Keith and Elliot Smith, in which the hero departs by leaving the trees, but it is also conveyed by Darwin, Osborn (1928), and Wood Jones (1916), where bipedalism becomes the means by which the hero "walks away" or "escapes" from his former existence.

Having departed, the hero moves in a new realm where he must survive a series of tests, function 5, imposed either by the environment (in the form of a harsh climate, predators, and so on) or by qualities of his own character. It is by means of these self-imposed tests, entailed by the hero's growing intelligence or upright posture—that is, his burgeoning humanity—that man seems to "make himself." The idea of self-destiny is stronger in some accounts than in others, but is present to an extent in all the narratives studied here. For it is precisely to bring out his special qualities that the hero is tested. Indeed, the tests are specifically designed for that purpose: to bring out the human in the hero.

As in folktales and myths, this transformation depends on a beneficent power or "donor." The appearance of the donor, function 6, is thus crucial to the outcome of the story. As mentioned earlier, the hero initially suffers from some deficiency, usually physical, and it is often in nonphysical form that the donor appears. This contrast between the physical weakness of the hero and the mental strength of the donor is characteristic of many accounts, including that of Darwin. The power of intelligence, defined variously as "discrimination," "plasticity," and "initiative," is also the donor in the accounts of Elliot Smith, Wood Jones, and Osborn.

In the folktale the hero acquires from the donor the use of a magical agent, perhaps a cloak, a sword, or a ring. Similarly, in human evolution the transformation of the hero, function 7, depends on special gifts provided by his intelligence: tools (Osborn), reason (Keith), a moral sense (Darwin). Still he is not finished, for, to prove his humanity, the hero must be tested again, function 8. Like his earlier ordeal, these tests are often imposed by the environment, usually the rigorous climate of Ice-Age Europe. But again, they can be self-imposed, by the very qualities of intelligence which have transformed him. Here, in the narrative of evolution, man's struggle often takes a turn away from nature and toward men. In any case, the function of these tests is to develop civilization and thus to turn the hero into a modern human.

Given that this was the objective right from the beginning of the story, the achievement of humanity may be thought to signify the hero's final triumph,

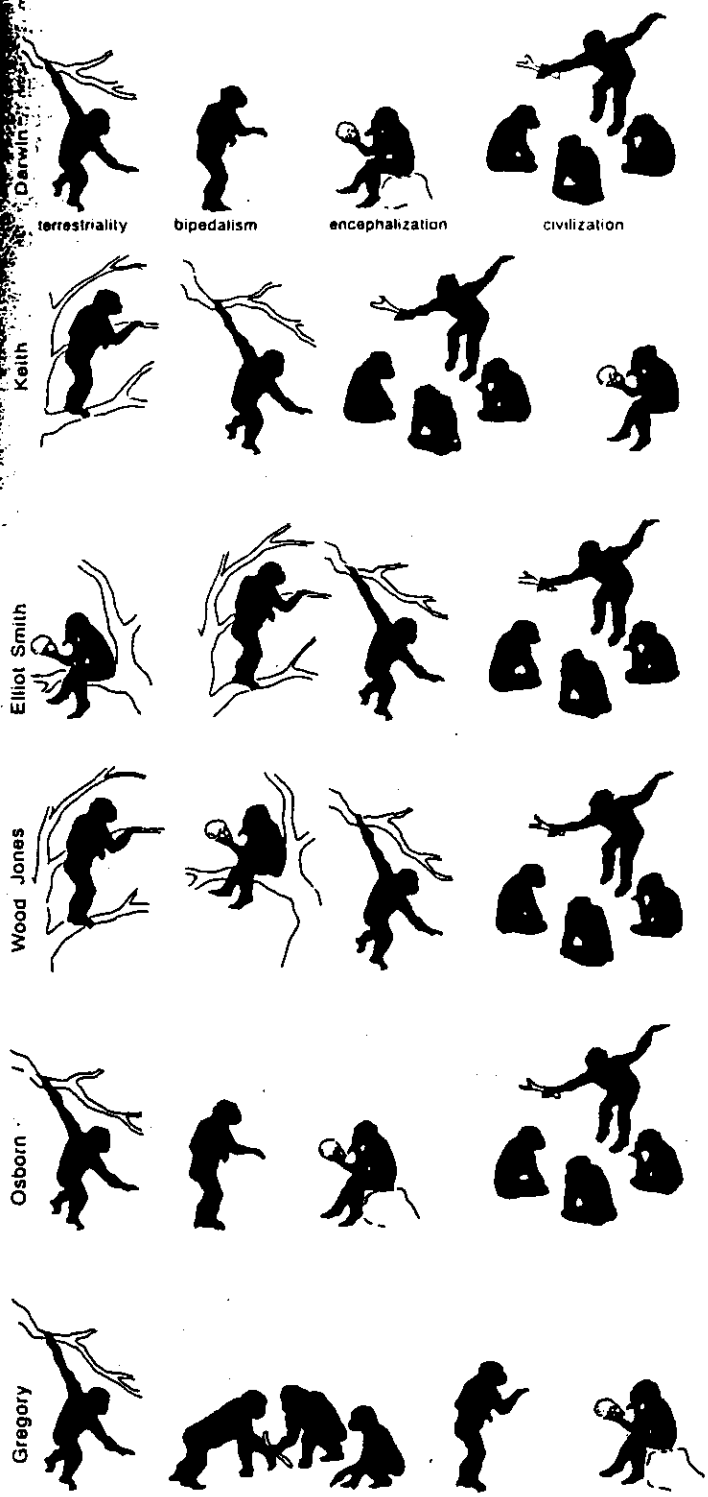


Figure 1. Accounts of human evolution usually feature four important episodes: terrestriality, or a shift from the trees to the ground; bipedalism, or the acquisition of upright posture; encephalization, or the development of the brain, intelligence, and language; and civilization, the emergence of technology, morals, and society. The nature of these events and the order in which they are supposed to have occurred varies from one account to another. According to Darwin, human evolution began when our ancestors, leaving the trees, adopted an upright posture. Other British and American scientists, writing in the early part of this century, held varying views, with Keith and Wood Jones considering bipedalism to be the first important stage, Osborn and Gregory designating terrestriality as first, and Elliot Smith holding that the first stage was encephalization. Gregory's scheme is unusual in placing the use of tools before bipedalism.

function 9. Yet there is a final irony, as in many myths. Again and again we hear how a hero, having accomplished great deeds, succumbs to pride or hubris and is destroyed. In many narratives of human evolution there is a similar sense that man may be doomed, that although civilization evolved as a means of protecting man from nature, it is now his greatest threat. Like many stories, this one draws to a close with the old question of how long man can be successful without succumbing to forces greater than himself.

In one of the most moving passages in *The Descent of Man* (1871), Darwin writes: "Man may be excused for feeling some pride at having risen, though not through his own exertions, to the very summit of the organic scale; and the fact of having thus risen, instead of having been aboriginally placed there, may give him hope for a still higher destiny in the distant future" (p. 405). For Darwin, man's hopes rest with his natural gifts, his "god-like" intellect and moral sense, and his capacity to be humane as well as human.

Oracles of human evolution have not always been so optimistic. "I know no study which is so utterly saddening as that of the evolution of humanity," writes T. H. Huxley in 1889, toward the end of his life. "Man emerges with the marks of his lowly origin strong upon him. He is a brute, only more intelligent than the other brutes, a blind prey to impulses, which as often as not lead him to destruction; a victim to endless illusions, which make his mental existence a terror and a burden, and fill his physical life with barren toil and battle" (p. 191). Redemption was not impossible, however. For Huxley, human salvation lay in science. Though it began to grow dim in his later years, this vision of the revolutionary power of science inspired Huxley's most memorable moments, including his debate with Arnold.

Can science use literary theory?

Many have since written on the relationship between science and the humanities, including Huxley's grandson. In his essay *Literature and Science* (1963), the novelist Aldous Huxley discusses the contribution of science to the literary conception of the nightingale. "And, what makes him sing at night? A passion for the moon, a Baudelairean love of darkness? Not at all. If he sings at intervals during the night it is because, like all the other members of his species, he has the kind of digestive system that makes him want to feed every four or five hours throughout the twenty-four." Illusions dispelled, Huxley is nevertheless optimistic. "To the twentieth-century man of letters this new information about a tradition-hallowed piece of poetic raw material is itself a piece of potentially poetic raw material. To ignore it is an act of literary cowardice. The new facts about nightingales are a challenge from which it would be pusillanimous to shrink" (p. 117).

Thus literature may turn scientific findings into prose or poetry. But can science use literary theory in a similar way? How should scientists respond to the claim that at heart they are, like all human beings, storytellers? One option is to deny it. Fitting theories of human evolution into a common narrative framework does not prove that they are stories, and it may even be argued that theories of human evolution do not actually fit into

such a framework. It is worth noting that Propp's study of the fairy tale makes explicit a set of intuitions which he believed to be shared by his readers, "even though we might not be aware of it" (p. 6). Indeed, the success of his model has depended at least in part on the reader's familiarity with fairy tales. In an analysis of paleoanthropological writing, however, appealing to the intuitions of the reader is a rather different proposition. Not everyone will have read the authors discussed here, and, indeed, to many it will appear to run counter to common sense to suggest that scientists tell stories, let alone hero tales. To other readers such a point may appear obvious or even trivial.

But even if it is agreed that scientists tell stories, that is not the most important insight to be gained from a structural analysis. The fitting of theories into a common framework to demonstrate they can fit is not the point of structuralism. On the contrary, it is by examining in what way each theory deviates from the common model that a structuralist analysis may be most fruitful. For example, by comparing the different narrative functions of bipedalism, paleoanthropologists could clarify the ambiguity which surrounds the discussion of this stage in human evolution. Similarly, by comparing the narrative "roles" played by fossils, scientists may become more explicit about the subjective—and often highly imaginative—ways in which they reconstruct human ancestors. Specifying the underlying narrative structure of paleoanthropological accounts would thus provide a basis for comparing conceptual differences between theories.

Still it may be argued that what is true of early twentieth-century theories of human evolution is not true of other scientific theories. Darwin and Huxley saw moral meaning in the study of human evolution, as have many scientists since, and in this sense paleoanthropology could appear to be a special case. Yet this habit of vision has had adherents among other evolutionary biologists (Gould 1983). Even the most inhuman species can be viewed symbolically as victors in a struggle with nature. It does not follow, of course, that all evolutionary theories are hero myths or that they have an accessible narrative deep structure. Few theories are likely to be as suitable to structural analysis as those of human evolution. Nevertheless, literary criticism may have something to offer to disciplines other than paleoanthropology. By reminding scientists that they are interpreters of texts as well as of nature, literary criticism can help promote a new and potentially constructive self-consciousness among scientists. (It is here that a hermeneutic approach, with its emphasis on personal interpretation and multiple readings, may be most illuminating.)

With this goal in mind, let us consider three narrative premises commonly found in scientific accounts

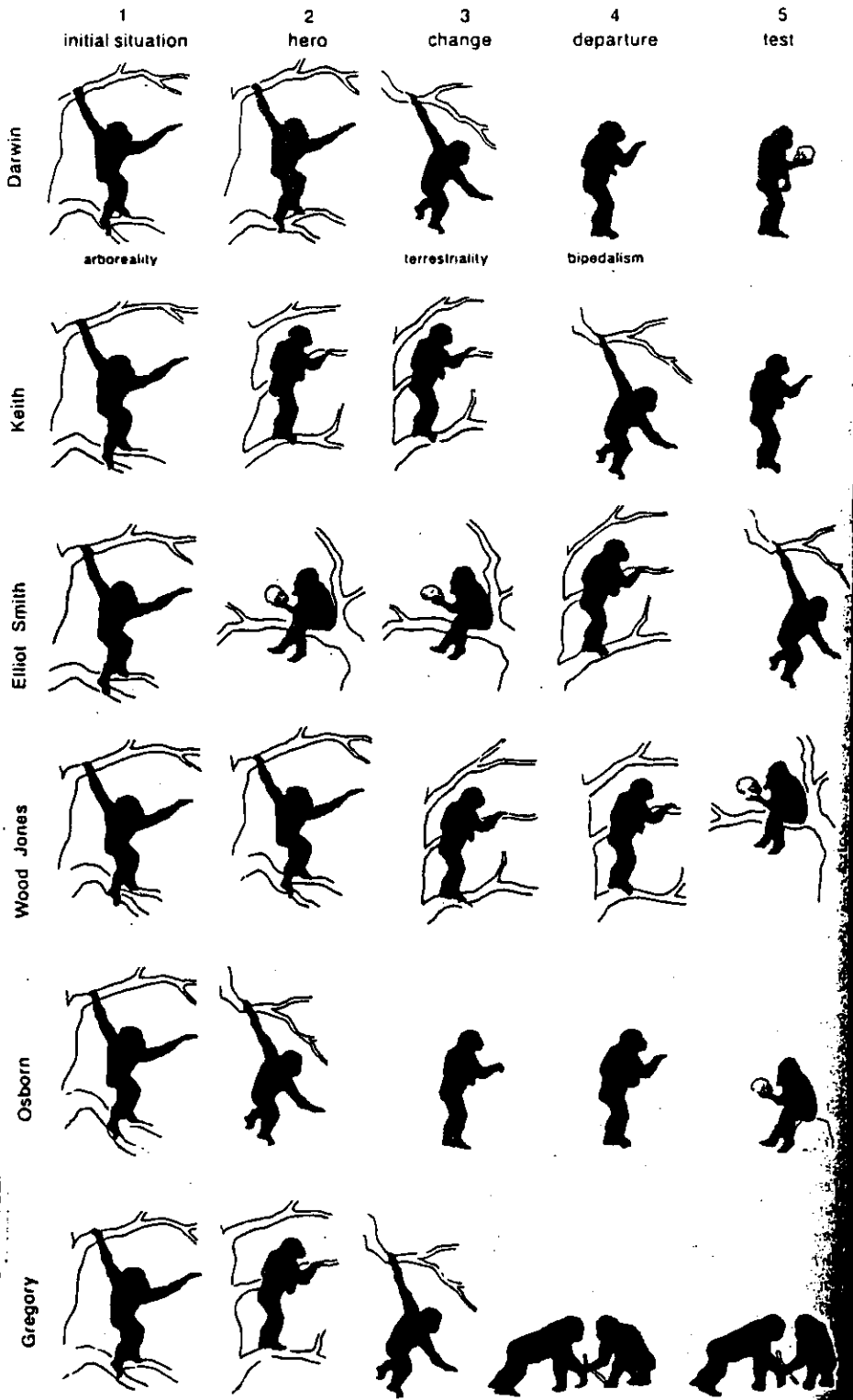


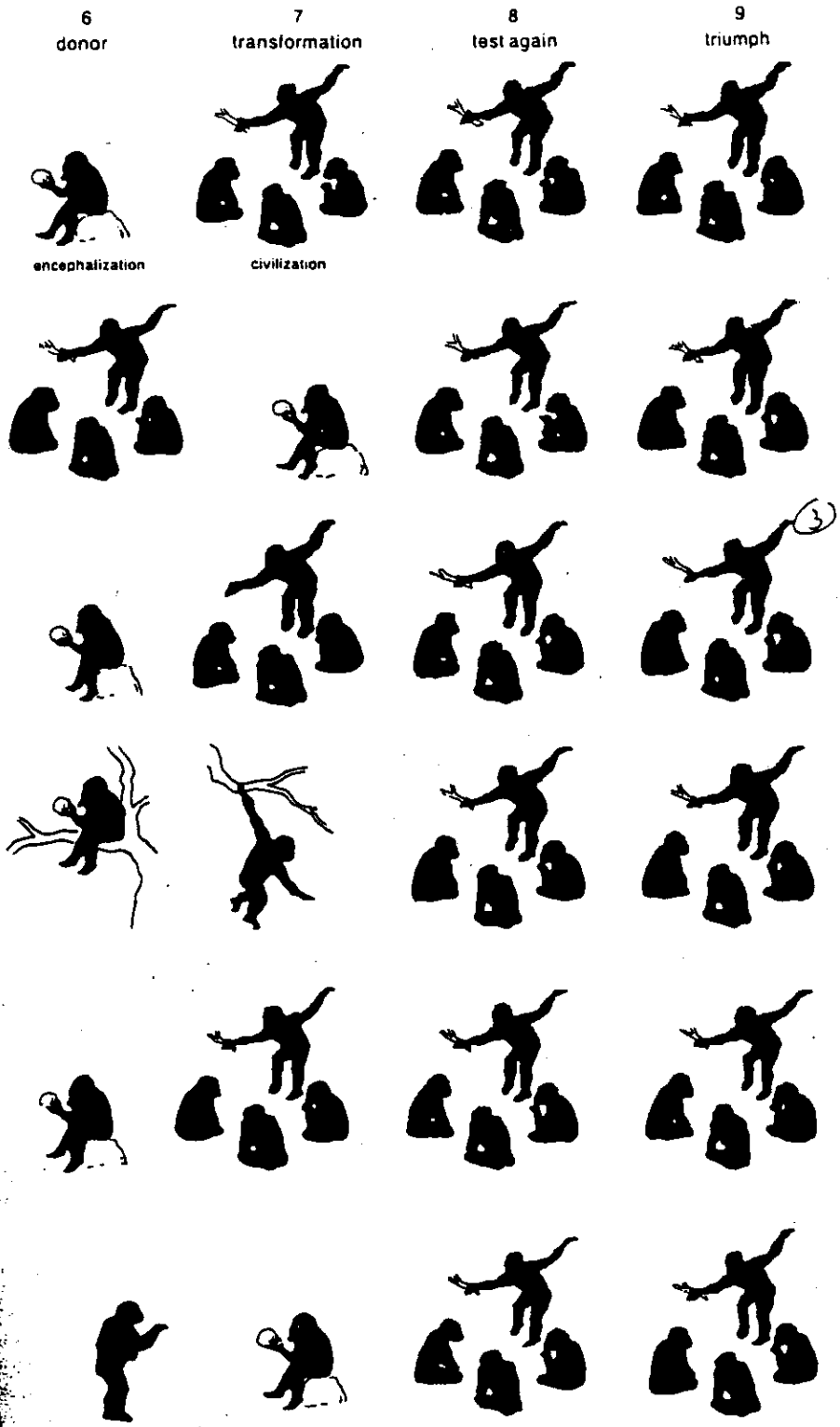
Figure 2. Although the order of events may vary between paleoanthropological accounts, they tend to fall into a common narrative stucture. This underlying structure can be represented by nine basic actions or "functions," each of which can be filled in several

of the past. One such assumption, often taken for granted, is that history can be seen as a meaningful totality. "No vestige of a beginning, no prospect of an end"—James Hutton's famous aphorism notwithstanding, the search for origins has been a dominant theme in the historical sciences. Behind this search lies the idea that scattered events of the past can be linked with the present in an overall continuous series, a view owing much to the principle of uniformitarianism and to Hutton's conception of the earth as a system of matter in motion. In tracing histories or seeking origins, however, scientists follow a literary principle as well: that a sequence of events should be organized into an intelligible story with a beginning, a middle, and an end.

Another important though rarely stated premise is that history can be seen as a series of critical moments and transitions. Once they are organized into narrative form, individual events that had been conceived of as merely successive often gain additional significance, as "turning points," "crises," or "transitions." This is especially true of Darwinian narratives, which, owing to their emphasis on natural selection, are often cast in terms of transformation through struggle. Events are not inherently crises, however, nor are they transitions; they acquire such value only in relation to other events in a series. The problem is that once events acquire such meaning, they may become associated with moments of crisis or transition found in other kinds of narratives, such as "fall and redemption," or "empire and decline," and thus can take on connotations reaching far beyond their original contexts.

A third narrative presupposition often found in scientific interpretation is that history can be explained by arranging events into a sequence. Selecting events and arranging them sequentially involves considerations of causality as well as of chronology. The question of what happens next often cannot be answered separately from the questions of how and why it happened and how it all turns out. Thus, although scientific explanations may invoke specific laws to account for events (for example, the principles of natural selection, uniformitarianism, or genetics), such explanations must be distinguished from the explanatory effects produced simply by the sequential ordering of events. In other words, the task is to determine whether scientific explanations apparently based on natural laws are actually a function of narrative procedures.

In recognizing that scientific methods depend to an unsuspected degree on narrative procedures, we face further problems. Does working within a narrative form negate the conscious goals and rationales of doing science? This question can be rephrased as: Are narratives testable? One reply is that by specifying a temporal sequence of events, narratives can be used to predict what future investigations will disclose



ways. (Events that are latent or continuing from a previous stage are shaded in light gray.) Such a structure can also describe traditional literary forms such as the folktale or hero myth.

about those events, and thus are open to falsification. The greater the number of events in the temporal sequence, the more testable the narrative (Goudge 1961). This principle may provide a rule for constructing narratives as well as for choosing among them.

A more basic problem, however, is not whether a particular sequence of events is falsifiable but whether narrative, generally speaking, is an appropriate form of scientific hypothesis. Again, we can rephrase the question to ask whether there is any way to present an evolutionary or historical account that does *not* involve storytelling. Trying to subvert narrative procedure, as do some contemporary fiction writers, is a possibility, though one requiring great literary ability. Given the difficulty of such an approach and the irreducibly diachronic aspect of history, a more realistic solution may be to treat narratives even more seriously than before. Rather than avoid them, scientists might use them as they are used in literature, as a means of discovery and experimentation. Treating scientific theories as fictions may even be a way of arriving at new theories. As critic Frank Kermode has observed of literary paradigms (1967, p. 24), "If we cannot break free of them, we must make sense of them." In science, too, telling new stories will require skill as well as imagination.

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TECHNOLOGY BREAKTHROUGH: THE CORDLESS TOASTER