

CHAPTER 17

Summary and Conclusions

“There is grandeur in this view of life, 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, created”

[Darwin, 1859, pp. 459-460].

Introduction. Where did we come from? How did we become the way we are today? Why did we diverge from our ancestors? What happened next? These are questions I have grappled with in the foregoing pages, guided by Darwin’s theory, aided by fifteen decades of scientific evidence that has accumulated since his day, building on analyses and explanations created by other scientists, and propelled by my own attempt to explore a new way of approaching these provocative queries.

There are two elements to the method I used that contributed importantly to the explanatory structure which emerged. The first is a strict application of the central rule of modern Darwinism: Every evolutionary change resulted from the reproductive benefits it provided. Second, I examined the origin and evolution of our lineage from a novel perspective—the idea that the bipedal use of hand-held weapons marked the onset of our lineage and that natural selection acted to refine and enhance this behavior because it promoted reproductive success. During millions of years, hominins underwent an evolutionary adaptation to throwing and striking because those with greater prowess in this behavior replicated more copies of their genes. (All ages of both genders derived benefits from this behavior, although it was mainly used by adult males). This simple proposition has made it possible to provide a coherent, Darwinian explanation for some of the most important issues in the study of early human evolution at the present time.

The structure of this explanation has been formulated as a theory. Its major strengths are first, it fills a void in the scientific study of our species, which lacks a theory of human origins and evolution [Tooby and DeVore, 1986; Bowler, 1986; Cartmill, 1990]. Second, it is parsimonious in the simplicity of its single explanatory principle (the adaptation to bipedal use of weapons). Third, it has a wide scope of application. Fourth, it is explicitly based on the modern concept of natural selection. Fifth, it can serve as a fertile source of predictions.

An explanation of a new evolutionary adaptation requires identification of the reproductive advantages associated with its onset. The adaptive feature should provide *immediate* benefits to get the process started. Then, the explanation must demonstrate that these advantages would continue through the succeeding generations during which the adaptation was established. In the case of bipedal throwing and clubbing, the duration appears to be about *five million years*—from hominin origins until some time after the emergence of *Homo erectus*. With a 15-year generation time, this would represent 333,000 reiterations of natural selection.

The behavior of using hand-held weapons from a bipedal stance fulfills both these stringent requirements: the immediate benefits and the enduring utility. It would have provided reproductive advantages to those who first employed it, and would have continued to do so for an indefinite period, because it was an effective way of settling disputes over scarce resources necessary for reproduction—namely, food, mates and safe habitats.

The assumption that it was primarily males who engaged in fighting with weapons fits all the evidence. The bipedal use of hand-held weapons, such as clubs and throwing-stones, would have given hominin males an advantage in conflicts with conspecific adversaries who did not use weapons or used them ineffectively, and in defense against predators, who could be driven off or killed with such weapons, particularly when they were employed in concert by groups of males. This strategy was effective in any habitat. Those who were most proficient in such behavior would have proliferated because they were more likely to survive and reproduce, a process that gradually yielded a unique animal, skilled in the bipedal use of weapons. While no longer adaptive in most modern environments, it remains an option against adversaries that lack firearms or elect not to use them. Mobs of protestors facing off against security forces are likely to include males throwing rocks or other projectiles and swinging clubs of some kind, often opposed by police also swinging clubs. This behavior is a relic of our evolutionary history.

The bipedal use of hand-held weapons theory. A distinctive goal of science is to increase understanding by explaining the regularities exposed by analysis of empirical evidence (Chapters 1, 16). The highest level of scientific explanation is the theory. Theories, like explanations in general, have two parts: the part that explains (the principles) and the part that is explained (the scope). The goal of theorizing is an explanation with a minimum of simple principles that explain a vast body of evidence by showing it to be the result of a few underlying causal factors. The epitome of such a theory in biology is Darwin's theory of evolution, of which the present theory is a derivative focused on our own lineage.

The single explanatory principle in the bipedal use of weapons theory is this: *The hominin lineage began with an innovative behavior (the bipedal use of hand-held weapons) to which it subsequently became adapted by natural selection.* A number of features of the human odyssey can be explained in whole or in part by

this principle. That is, they fall within its scope.

Human origins. What caused the first hominins to diverge from the ancestral ape lineage? Currently there is no accepted explanation, although many believe that “bipedalism” was involved. The fossil record supports this conviction, but no Darwinian account based on *bipedal locomotion* has yet been successful. Many hypotheses have been proposed, but none has proved compelling (Chapter 14). The theory presented here states that the behavior associated with the origins of the hominin lineage was another form of bipedalism: *the bipedal use of weapons*. This eliminates the obstacle that has stymied previous efforts to show how the first hominins could have gained reproductive advantages from bipedal walking. In contrast, there are numerous *immediate and continuing* benefits that would have ensued from the addition of weapons to existing methods of fighting—benefits that would have enhanced reproductive success, primarily by increasing access to food, mating opportunities and safe habitats (Chapter 3).

For males, acquiring sufficient nutritious food and fertile mates are keys to reproductive success. For females, food is the crucial biological necessity for personal survival and the process of reproduction itself. For children, food is essential for normal development. Using weapons from a bipedal stance can address these issues; bipedal walking cannot. This line of reasoning has led me to suggest [Young, 2003, 2009, 2010] (Chapter 3) that human origins can be accounted for by the onset of bipedal use of weapons. In subsequent generations such behavior would have escalated due to the advantages it yielded in the competition for scarce resources. Natural selection must have become involved at an early stage among the most capable armed apes, who were better able to nourish themselves and reproduce their kind, resulting in differential preservation of the genes of individuals whose heritable traits facilitated throwing and club-swinging prowess.

Bipedal locomotion. The idea that the first hominin specialty was bipedal locomotion implied that if a reproductive benefit could be discovered for such behavior the problem of human origins would be solved, but no solution has been found. This obstacle to understanding is eliminated by the concept that bipedal use of weapons *preceded* bipedal locomotion. Natural selection that improved ability to transmit an explosive burst of energy to a hand-held weapon while balanced in an upright stance on sturdy legs set the stage for a subsequent transition to upright walking. Bipedal locomotion emerged later, facilitated by adaptive changes in anatomy and physiology that were the result of selection for improved bipedal throwing and striking. Although bipedal walking and bipedal use of weapons share the fundamental element of upright behavior balanced on two legs, there are significant differences between them (Chapter 14). Throwing and clubbing motions involve rapid sequential patterns of muscular contractions adapted to maximize the amount of energy transferred to a hand-held implement in a single explosive act while the body remains in one place. In contrast, bipedal locomotion consists of a comparatively slow, rhythmic, repetitive pattern of muscular contractions adapted to minimize energy expenditure while moving the

body to another place.

A personal view. My research has led me to believe that our ancient predecessors survived and proliferated in part because males did use violence when anticipated benefits outweighed expected costs. Hominin males who used weapons in competition for scarce resources left more copies of their genes than those who did not. We are here because of their reproductive success. Emotionally, I feel a complex mixture of admiration, respect, pride and gratefulness to these ancestors of long ago. In the challenging natural habitats in which they spent their lives, each day presented dangers that could maim, cripple or kill, including falls, invading marauders, hungry predators, droughts, fires, starvation, infections, parasites, and diseases—difficulties that from a modern perspective seem horrendous.

Life in a state of nature may sometimes have been poor, nasty, brutish and short, but it was never solitary. This I too admire, that our ancestors lived in social groups of both genders who raised children and gradually forged unprecedented ways of cooperating with each other and aiding those who needed help. I am grateful to those who kept our lineage from the common biological fate of extinction, leaving to us the privilege of serving as vehicles of the precious genome that has been preserved and renovated during millions of years and hundreds of thousands of iterations of natural selection.

If some among our pre-hominin relatives began to use weapons and others did not, which would be most likely to stay alive, find food, acquire mates and raise children to continue the lineage? The answer I have suggested is that those who used weapons from a bipedal stance gained an advantage that increased their chances of survival and reproduction of their genes. That is the central principal of the explanation I have presented for human origins and early evolution. My wish is that this simple proposal will be provocative, thoughtfully examined, transformed in ways that enhance its explanatory value, and will promote understanding of our place in nature.