Man, the Tottering Biped

a review and editorial by Aline Newton, Certified Advanced Rolfer

Man, the Tottering Biped: The Evolution of his Posture, Poise and Skill
by Phillip Tobias, University of New South Wales, Kensington, NSW Australia, 1982.

One of the ways we describe the goal of Rolfing® is to improve the alignment of the body. One of the favorite expressions that have come down to us from Ida Rolf is that human beings are organized around a line. The evolutionary perspective that Phillip Tobias presents in his talk,

Man, the Tottering Biped: The Evolution of his Posture, Poise and Skill has the potential to fill in details to deepen our understanding of these long-cherished ideas. Tobias' story of the evolution of uprightness also holds some surprises for us: As we shall see, it calls into question the propensity to emphasize the importance of structure over nervous system influences and challenges the assumption that the organization of posture is from the ground up.

The evolution of upright posture and bipedal walking involved changes in many bones and muscles. These changes are verified in both the fossil record and in comparative anatomy between humans and apes. In the course of evolution to uprightness, the spinal column and skull (axial skeleton), the pelvis and legs, and all the related joints, ligaments and muscles changed to accommodate the upright posture and bipedal stance. The spine developed secondary curves in the lumbar and cervical vertebrae; there was an increase in the size of the vertebrae from the top down; the ribcage flattened; and the change in the relative size of the cranium and jaw allowed the balance of the head to shift back, requiring less powerful musculature on the back of the neck. The orientation of the ilia changed and the composition of the bone itself adjusted to the change in weight bearing. The adaptations continue down through the femur and foot.

The adjustments to upright posture and bipedal gait extend from the base of the cranium to the distal phalanx of the great toe (p. 30).

From head to toe, the bony system and the muscles have adapted to upright posture. These changes have brought the center of gravity closer to a vertical line that travels through the center of the body.

The musculo-skeletal adjustments to uprightness had the effect of bringing the line of weight transmission, or the body's center of gravity, very close to an axis extending from the occipital condyles to the upper part of the sacrum and then through the ilium, acetabulum and the head of the femur on each side to the twin tripods of the human feet. The effect has been that the upright body's gravitational axis is in a plane more or less equidistant from the two primordial surfaces of the body, the dorsal and the ventral (p. 42).

The effects of this concentration of the body's weight line are enhanced stability, better balance in standing and walking, and the ability to stand with a minimal expenditure of muscular energy.

The musculo-skeletal adjustments that have occurred as humans evolved towards uprightness and bipedalism have improved the balance of the bony framework and minimized involvement of muscular action in the maintenance of the upright stance (p. 44).

The decrease in the amount of energy involved in maintaining upright posture enables other activities:

Only a small part of man's muscle potential is used in the well-poised business of standing erect and walking in relaxed fashion on the level...We have stated, too, the belief that it is the very smallness of this muscular input and the large extent of the untapped potential that have permitted man to develop his bodily techniques in skilled movements (p. 56).

The change in the center of gravity releases the muscles from the job of support and frees them to be able to perform actions that are uniquely human.

Unfortunately, some of the work of millions of years of evolution can be undone by the effects of modern life. Bad posture, shortened lines of muscular action, and chronic tension can all take the body back a step to a less aligned stance, one that costs more in energy expenditure and limits the range of activity. This is how we have traditionally understood the goal of the Rolfing process. It is designed to bring the body back (or forward!) into an easier alignment, following the direction of evolution. The more central the weight line, the line of gravity, the less muscular effort is needed for the simple act of standing or walking on level, the more potential there is available for other activities.

In Tobias' story of evolution, the structural changes he describes are also accompanied by changes in the nervous system. For humans, maintaining uprightness involves subtle sensory cues: vestibular (balance) and proprioceptive (locating oneself in space), that allow us to keep our balance without a huge amount of muscular effort. Tobias offers some evidence that the cerebellum, the part of the brain that plays a large role in balance, may have undergone a significant and rapid increase in size in the early upright hominid.

A man needs only delicate muscular contractions to maintain his uprightness even for long periods. This realization directs our attention to the subtlety of the sensory information that reaches the central nervous system during such an apparently simple act as standing or walking in a relaxed fashion (p. 45).

This suggests that working with the gravity system of the body involves more than structural considerations. Besides the alignment of bones and the organization of the musculature, an easy upright stance depends on perceptual information that is mediated through the human nervous system. Thus integration of the body in gravity will include working with the organization of perception as well as structure.

It is often assumed once human beings stood up on two feet they went on to be-

come tool users. Tobias points out the misconception in this assumption. It is not that upright stance and bipedal gait freed our arms; in fact in the course of evolution, the capacity to sit up with an erect spine occurred long before the ability to walk on two feet.

Truncal erectness was a fundamental and the most ancient phase in the evolution of bipedalism. Development of trunk uprightness probably long preceded that of the fully orthograde posture and might well have been present since 50-60 million years ago (p. 12).

According to Tobias, it is the stability of sitting upright that allows the development of manual skills.

Bipedalism is not the only circumstance under which a creature's hands are freed for such activities as tool-using and toolmaking: all that an animal needs to do is to sit upright, for its hands to be available for implemental and other activities. It is in the sitting position that our bodies find greater stability; and stability is a most important structural and functional consideration in the development of manual skills (pp. 10-11).

Tobias suggests that humans may even have evolved into quadrupeds from tree clinging ancestors, creatures whose upper limbs were as significant for their movement and survival as their legs:

the quadrupedal stage may mark the transition between an hypothesized, distant, vertical-clinging ancestral stage and the uprightness of modern, bipedal man (p. 13).

This perspective emphasizes the importance of the upper girdle and the spine. Because of the strength of the structural point of view, it is often assumed that the most important factor in changing the walk will be the lower body. But the story of evolution reveals that the organization of the arms and spine long precedes the ability to actually walk on two legs. In fact we see that this is also true developmentally for each human: an infant uses hands and arms and usually also sits long before s/he begins to walk. The pattern of movement of the upper body and spine are established before the pattern of gait. When the baby stands up, the center of gravity of the upper body segment will influence the organization of the lower body. As practitioners this may be a consideration for us; to understand gait, we may need to look at the head, trunk and arms as equally significant a contributor as the legs.

The information in *The Tottering Biped* provides useful details to help substantiate the idea that human beings have evolved towards an uprightness that brings the weight line of the body into a more central position - into a kind of "center line." This is the structural perspective we are most familiar with. Balancing around the center line frees the structure from having to expend a lot of muscular effort in simple standing and walking. Tobias also provides background for expanding the structural perspective in two important ways: one is by including the evolution of the perceptual system as an essential component in the evolution of uprightness. The other is to restore the significance of the upper body in the way we look at gait.